Closed Loop Controller
MP Series
Reference Manual

Table of Contents

Chapter 1: Introduction and Product Description

The AMS **MP300CL SERIES** controller is a closed loop length control system used on roll formers and cut-to-length machines that produce sheet metal parts from coil stock. The **MP300CL SERIES** controller is the most advanced control system available and will greatly enhance the performance and productivity of these machines. Other control systems use general purpose electronic counters as the length control device. These systems can be difficult to use and offer little added benefit beyond material measurement and piece counting. The AMS controller is a custom designed microcomputer that is designed exclusively for cut-to-length machines, which enables the **MP300CL SERIES** controller to offer many features not available on simple electronic counters.

In seeking to design a new generation electronic length control system, AMS Controls had the following goals in mind:

- Improve the length accuracy
- Improve the machine productivity
- Reduce the amount of material waste
- Provide in-line punching control (if using punching option)
- Easy for the operator to use
- Adaptable to a wide variety of machines

All of these goals have been achieved with the design of the **MP300CL SERIES** Controller.

Accuracy

On most cut-to-length machines without servo drives, accuracy depends upon the repeatability of the machine to run at a constant speed and to delay the same amount of time for each operation. Closed loop control systems compensate for these errors to produce the most accurate parts possible. Since the **MP300CL SERIES** controller is designed exclusively for roll formers and cut-to-length machines, it has additional features that give even better accuracy than other closed loop systems.

Productivity

Productivity can be improved with the AMS controller in three ways. First, the improved accuracy with the **MP300CL SERIES** controller allows machines to be run at higher line speeds. Secondly, for feed-to-stop machines, the Adaptive Slowdown feature insures a minimum feed time for any length run and any hole spacing. Thirdly, for all types of machines, the multiple order feature (available for the **MP350CL** and **MP350PCL**) allows many jobs to be programmed at one time (even while other orders are being processed and run), so delays between orders can be eliminated.

The AMS Controller eliminates a large amount of material waste by only requiring a single manual cut at the beginning of a new coil. This cut can be made while the machine is stopped, as opposed to a flying crop cut, which further reduces waste.

Easy to Use

The **MP300CL SERIES** Controller is a sophisticated computer running a very complex program. This does not, however, mean that a computer expert is required to operate it. The controller has a liquid crystal display (LCD) that prompts the operator for information in plain English and with words that are familiar. On the “Status” display, the operator can see the order that is being run, his progress through the order, and the speed of the line.

Easy to Install

The **MP300CL SERIES** Controller has logic built into it to handle most machine control functions. The user does not need to add Programmable Logic Controllers (PLCs) or relay logic circuits to get the correct machine sequence and safety features.

The AMS controller can control a variety of different machines. For each type of machine, a different set of machine parameters must be programmed into the controller. To simplify this procedure, the type of machine is programmed via a set of switches. The controller reads these switches to determine the type of machine it is connected to. It can then limit the list of parameters that must be programmed to only those that apply to this type of machine.

About this Manual

This manual gives detailed information on the installation, operation, and maintenance of the **MP300CL SERIES** Controller. Instructions for installing the AMS Controller on most machine types are included. AMS engineers can help on installation conditions not covered by this manual. Instructions on how to operate the controller are included. This covers how to program orders and run them. It also covers the best way to handle a variety of special circumstances that can come up with most machines of this type. Another section of the manual includes a guide to follow if problems should arise.

The Setup sheets in Appendix A provide a place to record information about your particular installation. Be sure to record this information and keep this manual in a safe place for later referral. If calling AMS for technical assistance, be sure to have this manual in front of you as well as the model number and serial number of the controller and software version number (displayed when the controller is turned on).

Note: AMS Controls reserves the right to change the operation and/or directions within the manual without notice or approval.

System Description

The Open Loop Control System

An Open Loop Electronic Length Control System is the controlling mechanism for machines that produce individual parts from a coil of stock material. Block diagrams of example systems are shown in Figure 1-1 and 1-2. Many other configurations are also possible.

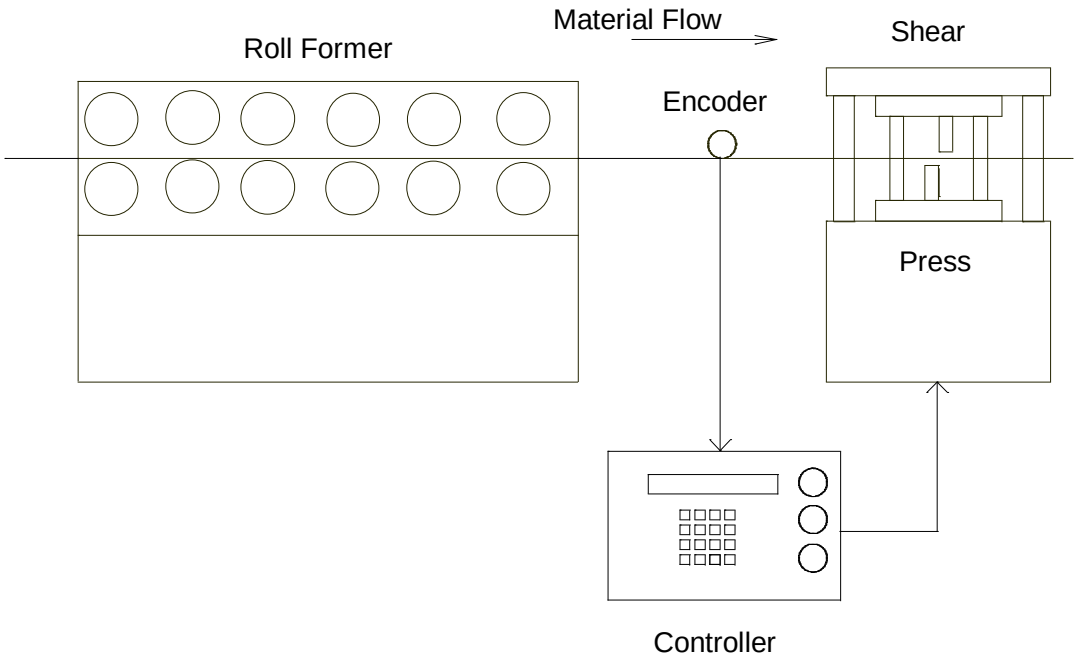

Figure 1-1. Electronic Length Control System Block Diagram

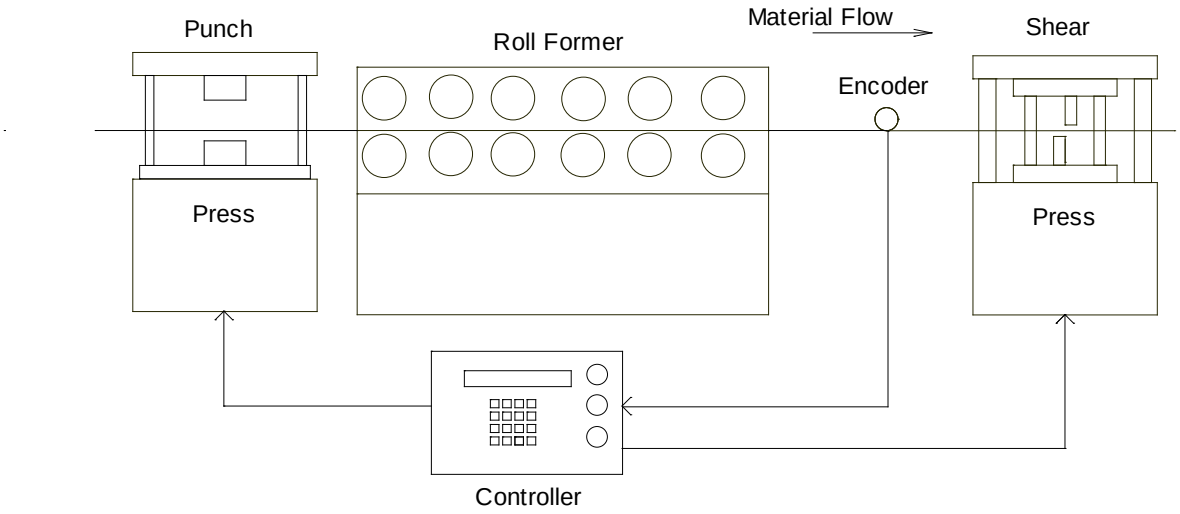

Figure 1-2. Control System with a Shear and a Punch

The controller performs the following functions:

- Controls the material movement through the machine.
- Measures the amount of material moving past the cutoff press.
- Cycles the punch presses at programmed points.
- Cycles the cutoff press at the programmed length.
- Stops the machine when the correct number of parts is produced.

The measuring device is an optical shaft encoder, also called a pulse generator. A wheel with a known circumference is attached to the encoder and rides on the material. As the material moves through the machine, the wheel rotates and the encoder generates electrical pulses proportional to the amount of material moved. The controller counts these pulses to determine how much material has moved through the machine. When the material reaches a point

where a punch is needed, the controller cycles the punch press. When the material past the cutoff press is equal to the length of the part programmed, the controller cycles the shear press and increments the quantity that is DONE. When the quantity DONE is equal to the programmed quantity, the controller stops the machine, unless other items are programmed to run immediately.

There are two basic categories of automatic cutoff machines: flying cutoff machines and feed-to-stop machines. With flying cutoff machines, the material does not stop for each cut and the cutoff die moves along with the material during the shearing cycle. With a feed-to-stop machine, the controller stops the material for each cut and the cutoff die remains at a fixed location. The common practice for this type of machine is to shift into a "creep" speed just before the cutoff point to increase the precision of the cut and reduce the jolt that can occur if the material is abruptly stopped. The controller controls both the speed shift and the stopping action.

The Closed Loop Control System

There are two types of closed loop control systems. The closed loop die accelerator is used on flying die machines. The closed loop roll feeder is used on feed to stop machines.

A block diagram of the closed loop die accelerator system is shown in figure 1-3.

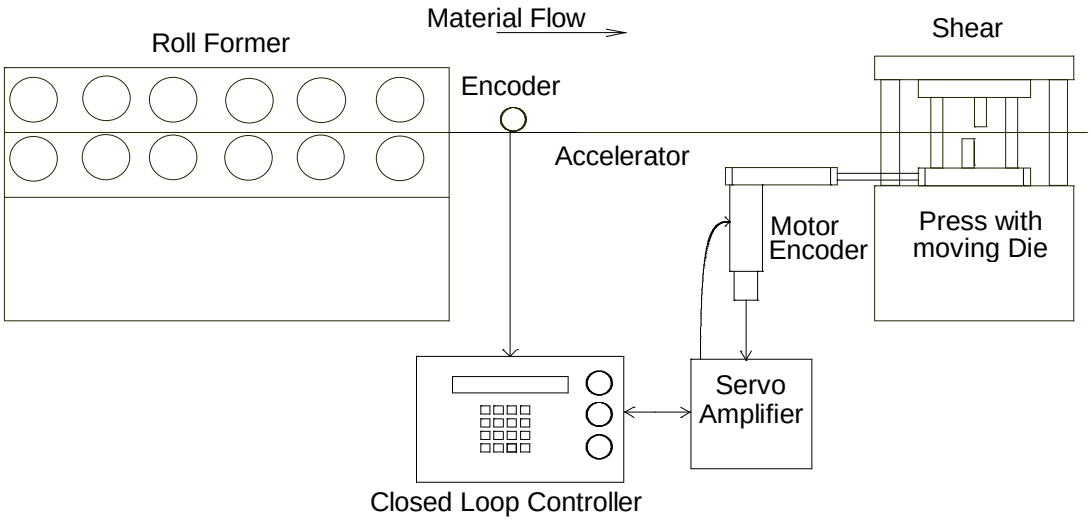

Figure 1-3. Closed Loop Die Accelerator System

The material is driven through the press by the roll former at a steady speed. The closed loop controller measures the material movement. When the cut point is near the cutoff press, the die is accelerated by the motor. The servo loop attempts to drive the position error between the die and the cut point to zero. When this is achieved, the speed of the die matches the speed of the material, and the cut can occur.

The main difference between this system and the open loop cutoff system with a die boost device, is the fact that the controller knows the exact position of the die at all times. This allows the controller to make an exact match up of the cut point with the die. With the open loop system, the controller has no control over the position of the die and depends upon material speed matching and consistent machine speed to get accurate results.

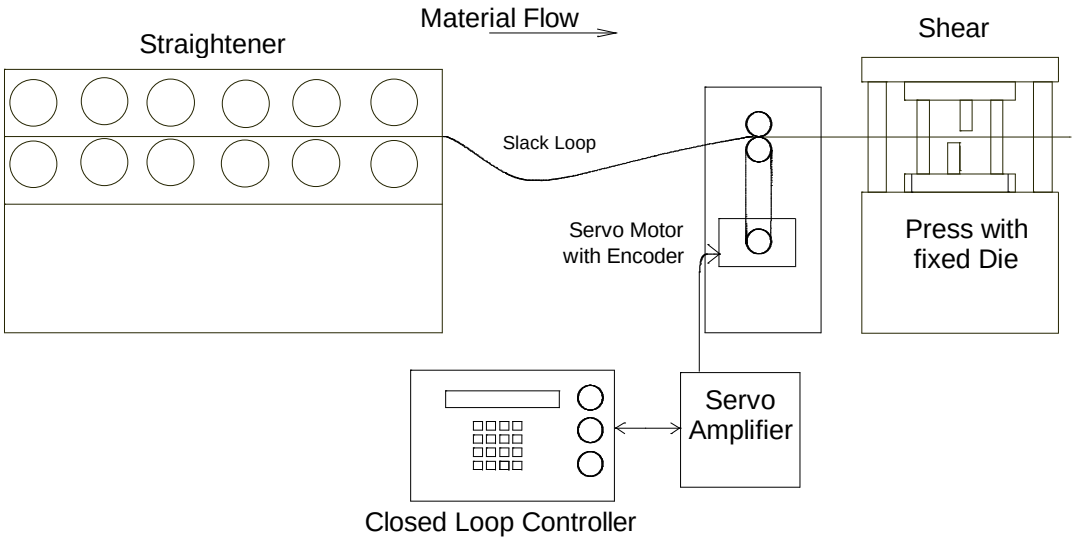

Figure 1-4. Closed Loop Roll Feed System.

A block diagram of the closed loop roll feed system is shown in figure 1-4. In this system, the material's position and velocity is controlled by the **MP300CL SERIES** controller via the servo amplifier and a set of pinch rolls. The amount of movement is measured by an encoder which is coupled to the motor (resolver), or by a line encoder riding on the material along with the motor encoder in a two encoder system. This method can generally provide even greater accuracy since the resolution of most resolvers is much finer than that of most line encoders.

Assuming that there is no slippage between the material and the pinch rolls, the controller is able to keep track of the exact position of the material, control its acceleration and velocity, and stop it at a pre-programmed punch or cut length.

For feed roll systems which have a large distance between the feed rolls and the press, or with systems that have a potential for feed roll slippage, a second encoder may be added. The second encoder should ride on the material and should be placed close to the press. It will also measure material movement and send that information back to the controller.

The AMS controller can then verify that the amount of material which has gone past the pinch rolls is the same amount of material which has gone past the shear. In other words, if the material slips under one encoder but not the other, the controller can sense this and shut down the line.

MP300CL SERIES Controller Hardware Description

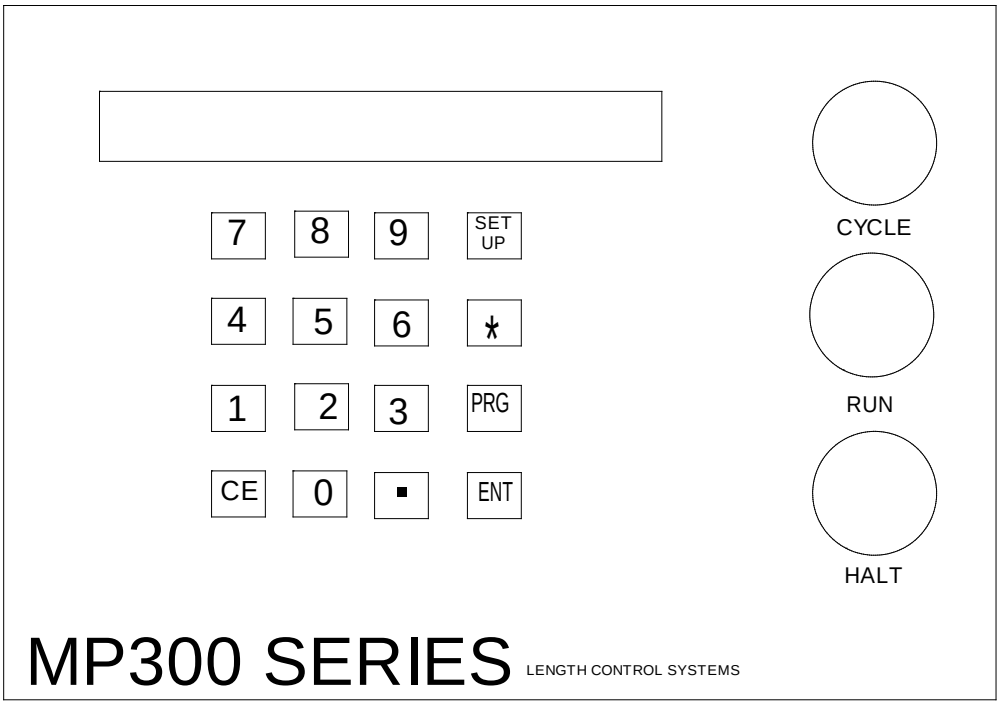

Figure 1-5. MP300CL SERIES Front Panel

Microcomputer

The **MP300CL SERIES** controller is the control element of an advanced length control system. It is equivalent to a personal computer (PC) packaged in a rugged industrial enclosure. Programs are stored in PROM (Programmable Read Only Memory) memory, instead of a disk. These programs were written by AMS to perform the specific task of length control and the PROM is factory programmed.

The user does not have to write programs for the controller and only has to enter data on what to produce. This data is stored in RAM (Random Access Memory). In a normal PC, this memory is erased when power to the PC is removed. In the **MP300CL SERIES** controller, a battery maintains this memory when the controller is off and user data does not have to be re-entered each time power is removed. RAM is used to store machine setup data and job information data.

Operator Interface

Replacing the monitor and keyboard of a PC, the **MP300CL SERIES** controller has an LCD (Liquid Crystal Display) screen and a small keypad. The LCD has two lines of display with 24 character positions on each line. The keypad, shown in Figure 1-6, has 16 keys for basic numeric entry. Any non-numeric data required is achieved by scrolling through the available options on the display and selecting the correct one. For example, units of measurement are displayed in inches, centimeters, or millimeters. When selecting this parameter, pressing any number key will cause the display to toggle between “English”, “Metric MM”, and “Metric CM”. Pressing the ENTER key when the correct variable is displayed will select that option. This method keeps the data entry simple and avoids spelling errors.

There are three control push button switches on the panel of the controller for CYCLE, RUN, and HALT functions. These are large industrial grade controls that activate machine functions. The CYCLE switch is used to cycle the SHEAR and to zero the length counter. This function is active in the manual mode on all types of installations. In the automatic mode, the CYCLE switch is only active on non-stopping machines to allow for the operator to cut out bad material without stopping the line. The RUN switch is used to put the controller in the automatic mode and to start production. This function is not active on installations where

REMOTE RUN is selected. The HALT switch will stop production and place the controller in the manual mode.

Controller Keys and Functions

To help the operator become familiar with the keys on the controller, a brief description of the function of each key will be given.

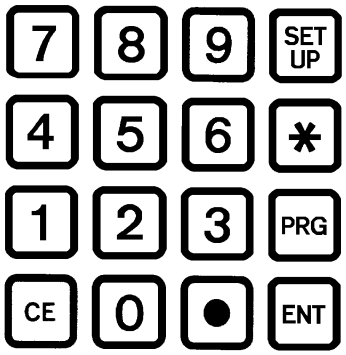

Figure 1-6. MP300CL SERIES Keypad

SET UP

This key is used to select one of two or three menu's to access other items. Among them are: assign the next job to run, increment the quantity of an order to make another part, view the three footage totalizers, adjust the machine setup parameters, perform the calibrate trim procedure, enter the I/O screen, perform a memory test, clear hole counts on a hole detect controller, jog the die, run the die test, and view the tolerance that the controller is achieving.

Asterisk (*)

This key is a STATUS key and will allow the operator to view the current job number in progress, the number of parts assigned to a job with the number left to run, and the current position of the metal past the shear.

PRG (Programming)

The PRG key is used to assign a job number and define the quantity and length of part to be run. If the machine has the punching capabilities, the type of punching option is also defined when programming a part.

CE (Clear Entry)

This is a “Clear Entry” key. The main use of this key is to correct the entered data when a mistake is made. Pressing this button will clear out the previously entered data so that the data can be entered again from the beginning. This key is also used to clear any messages displayed.

ENT (Enter)

This key can be defined as a “take it” key, as the data that was entered into the display is not accepted by the controller until the Enter key is pressed.

Inputs

The main input into the controller is the group of signals from the encoder. A simplified diagram of this circuit is shown in Figure 1-7. The encoder outputs are differential line drivers which work well in electrically noisy environments. With the twisted pair cable, electrical noise is induced equally on both the normal and the complement signals. The differential line receiver in the **MP300CL SERIES** controller looks at the difference in the two signals only. This causes the noise on the two lines to cancel each other and thus greatly increases the noise immunity of the encoder circuit.

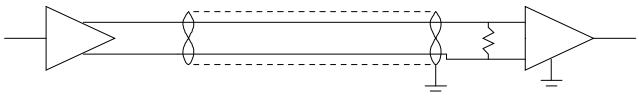

Figure 1-7. Simplified Encoder Channel Circuit

There are eight discrete inputs into the **MP300CL SERIES** controller. They sense continuity between an input and a common connection. A typical diagram of an input circuit is shown in Figure 1-8. This circuit requires a 24 VDC biasing circuit that is provided either by the user or by the AMS controller, depending on the controller configuration. **Note that no voltage source should be connected to any input.** Doing so can severely damage the controller. Relay contacts, limit switches, or control switches are the most common inputs used. The input may also be the collector of an open collector NPN transistor which has its emitter connected to the common terminal. Current in each input circuit is limited to 15 milliamperes.

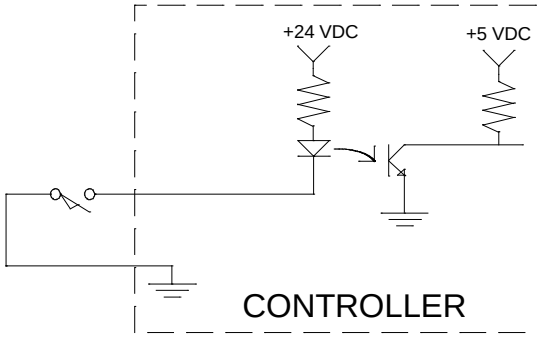

Figure 1-8. Typical Input Circuit

Outputs

Depending upon the configuration of the **MP300CL SERIES** controller, there are three possible types of outputs available. These are Standard DC, AC Relay, and Analog.

Standard DC Output

The Standard DC output of the **MP300CL SERIES** controller is a 4 Ampere open collector transistor. This is available in all configurations and for all outputs. A diagram of this circuit is shown in Figure 1-9. The biasing voltage for the load can be from 12 to 24 volts. If this voltage source comes from outside of the **MP300CL SERIES**, the common of this supply must be connected to the common of the controller. The suppressing diode shown, reduces the noise generated by inductive loads when the transistor turns off. The load can be either a DC solenoid or a DC Relay.

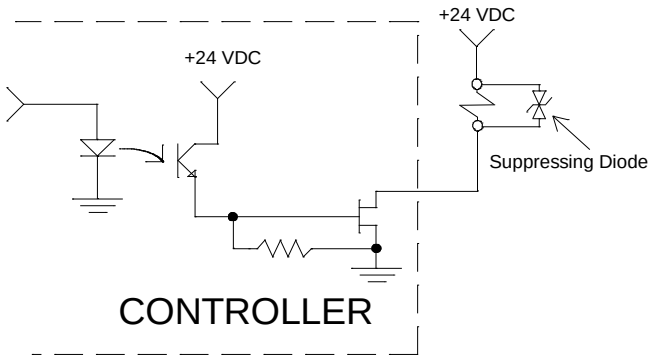

Figure 1-9. Standard DC Output

AC Relay Output

The AC RELAY OUTPUT is a 5 ampere dry circuit relay contact that is available on outputs 1 through 6 of the AC Consolette model and on the FORWARD output only of the SL Consolette model. Normally open contacts are available on all outputs. A normally closed contact is available on the FORWARD output only.

Analog Speed Output

Analog Speed Output is included with the **MP300CL SERIES** controller. The controller will provide an analog voltage signal that varies between -10 and +10 volts DC. This output can drive a 1000 ohm load. The voltage produced is proportional to either the roll speed in the feed-to-stop system or the die speed in the die accelerator system.

Special Features

Die Test Mode

A closed loop die accelerator system is a highly sensitive and precise system that must be carefully adjusted to achieve good results. With any sensitive servo system, the possibility for instability is always present. Dampening of the response of the loop will stabilize the system, but too much dampening will make the system sluggish and unresponsive.

To optimize the system, the die accelerator needs to be tested under normal operating conditions. Test pieces can be cut but this produces scrap and can cause jamming or die damage if conditions are not right. To solve this problem, the **MP300CL SERIES** controller has a DIE TEST mode which simulates material movement without actually running the roll former. From the Status Screen, continue to press the SETUP button until the following screen appears. Press the number 2 key to enter the Die Test mode.

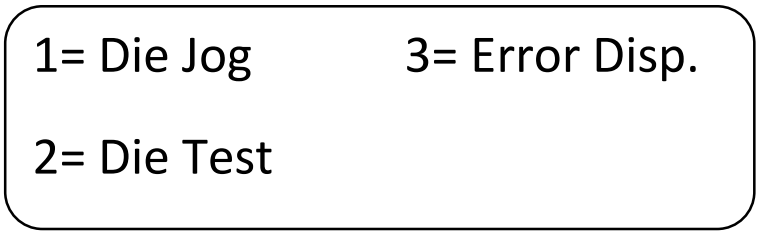

Figure 1-10. Die Jog, Test, and Error Screen

The operator sets the part length to run and line speed and the controller generates internal line encoder pulses to mimic what would happen when the roll former was running. The die accelerator cycles as it normally would. The only difference between this mode and normal operation is that the **MP300CL SERIES** controller will not stop the line on an OUT OF TOLERANCE error and it will not cycle the press in this case.

While in the test mode, both servo amplifier parameters and controller parameters can be adjusted to achieve stable, responsive results. When TOLERANCE is achieved, the controller will begin cycling the shear.

The TOLERANCE can be displayed by the controller by selecting “Error Disp.” from the same screen that enters the Die Test, figure 1-10. Note that this display shows the electronic tolerance error of the cut part by comparing the number of pulses received by the Line Encoder to the number of pulses received by the Die Encoder. The physical tolerance of the cut part may or may not be as accurate as the displayed value due to mechanical tolerances in the die accelerator mounting, cutoff press, or material tracking inaccuracies.

Die Jog Mode

The ability to jog the die in and out is available using the JOG FORWARD and JOG REVERSE inputs. You must first go to the JOG DIE mode. From the Status Screen, continue to press the SETUP button until the Die Jog, Test and Error screen, figure 1-10, appears.

Press the number 1 and the display shows the position of the die. When the JOG FORWARD switch is energized, the die will move forward at the programmed JOG VELOCITY. When the JOG REVERSE switch is energized, the die will move in reverse.

Built-in Programmable Logic Controller

When designing a cut-to-length machine with an electronic counter for the length control device, a Programmable Logic Controller (PLC) or relay logic is normally added to generate the proper sequence of the machine and add standard safety features. AMS has eliminated the need for a PLC by building comprehensive control logic into the **MP300CL SERIES** controller. This logic implements the following features:

- Run-Halt control from either the front panel or external contact
- Manual cycle of the Presses only in the Halt mode on feed-to-stop machines
- Manual crop allowed while running on non-stop machines
- Jog in manual only
- Motor starter interlock circuit
- Automatic Shear or Press operation only in Run mode
- Halt on emergency stop or overload

The result is that the **MP300CL SERIES** controller can be adapted to most machines with a minimum amount of external electrical components. The only "programming" that a user must do is select the proper TYPE of machine through some switch settings. The controller then implements the proper logic based upon the TYPE.

Chapter 2: Installation

Controller Power

Depending on the model of the controller and the style of cabinet, an AMS controller may require 24VDC or 115VAC for operating power. All input power should be within the specification limits.

Power to the controller should be switched independently of other devices through a separate switch. This power should not be interrupted by the emergency stop circuit. In an emergency-stop condition, the controller should be able to track any movement of the material, therefore allowing production to resume after the condition is reset without any loss in accuracy.

Emergency Stop Circuit

Every machine should have some type of emergency stop circuit for the safety of the operator and for the protection of equipment.

Motion Outputs

The motion outputs available on the model **MP300** controllers are Forward, Fast, Slow, and Reverse. Not all outputs are available on all machines (see figures 2.2 and 2.3 for controller types and their outputs).

Line Movement

The “Line Movement” parameter was added to the software to handle the situation where the run output is wired for material movement. If the Run output is wired to control the motion of the material, the setup parameter LINE MOVEMENT should be set to “Run”. With the parameter set to “Run”, the Run output turns off immediately after the Halt button is pressed. If the LINE MOVEMENT parameter is set to “Fast/Fwd”, the Run output remains on while the material coasts to stop as it always has.

The “Forward” and “Slow” outputs should be used to put the material into motion. Using the “Run” output to put the material in motion could cause some problems in the operation of the machine. This is due to other features that are used in the controller. First, some controllers will continue to shear or punch after a halt has been performed in order to catch targets as the line coasts to a

stop. Second, a “Delay after Shear” feature is available to stop the material motion (Forward Output) after each cutoff. Even though the motion is turned off in both cases through the “Forward” output, the “Run” output remains on the entire time. If “Run” is used as the motion output in these cases, the line will not stop at the correct times!

If the Run output is used to control the motion of the material, the setup parameter “Line Movement” should be set to “Run”. The difference in operation is that with the parameter set to “Fst/Fwd”, the Run output remains on while the material coasts to stop. With the parameter set to “Run”, the Run output turns off immediately after the Halt button is pressed. The warnings mentioned above still apply to the circuit wired with the Run output controlling the material movement.

On two-speed systems, the “Forward” and “Slow” outputs will energize at different times depending on what speed logic is selected. Single speed systems will automatically have the Forward-Slow speed logic.

Closed-loop systems will also use Forward-slow speed logic when the outputs are available. The chart in Table 2.2 shows the output logic for each selection.

Machine State					
	Run Fast	**Run Slow**	**Jog Fwd**	**Halt**	**Jog Rev**
Forward output	**ON**	**ON**	**ON**	**OFF**	**OFF**
Slow	**OFF**	**ON**	**ON**	**ON**	**ON**
Reverse	**OFF**	**OFF**	**OFF**	**OFF**	**ON**
Run	**ON**	**ON**	**OFF**	**OFF**	**OFF**

Table 2.2 Status of Outputs in Forward-Slow

Shear Control Circuit

Optimal performance of the shear circuit can be met by customizing the AMS controller to a particular type of press and feed control by the appropriate setting of the “TYPE” setting switches. The controller can be configured to work with flying-cut or feed-to-stop applications. Outputs are available for SHEAR DOWN and SHEAR UP or SHEAR DIE BOOST.

AMS controllers are designed to connect directly to 24VDC solenoids for optimal performance. A solenoid driving device, such as the AMS 3840 power module, can provide more accurate firing of the press. See Figure 2.3 for wiring possibilities.

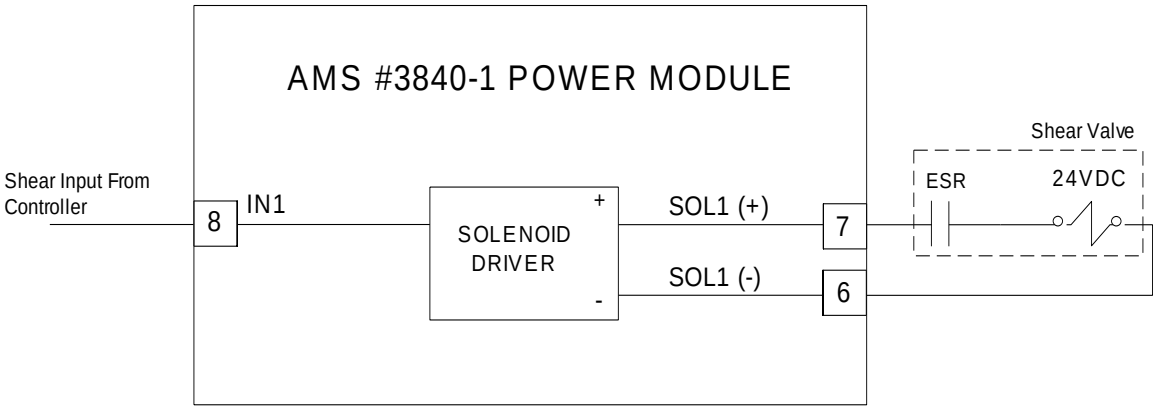

Figure 2.3

If the solenoid for any of the shear outputs is 115VAC, then an attempt should be made to replace the solenoid with a compatible 24VDC type. If this is not possible, then a 24VDC relay will have to be installed between the AMS output and the solenoid.

AMS controllers have a timed shear output with a switch input override feature. The duration of the **SHEAR DWELL** or **SHEAR DOWN** output is programmable from 0 to 9.999 seconds. Please refer to timing diagram - Figure 2.4. If the AMS controller detects a switch closure at the **SHEAR COMPLETE** input during the dwell time, the shear output will turn off immediately (Figure 2.5). This is especially useful on mechanical presses that will need the shear-complete switch mounted in a location that will return the press to top-dead-center. The SHEAR DWELL UP time will time out as programmed regardless of the complete input.

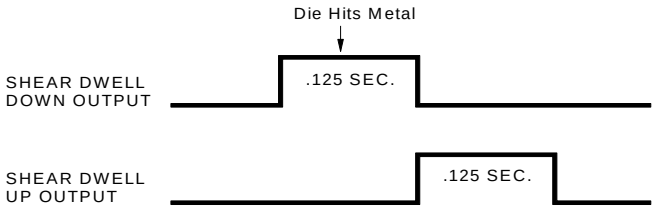

Figure 2.4

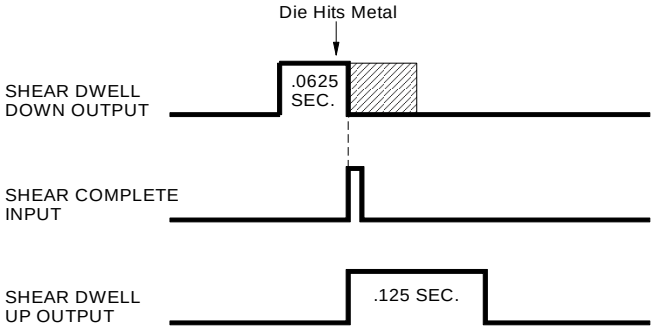

Figure 2.5

Press Control Circuit

The terms and definitions for the press control parameters are identical to it's shear control counterparts. The press parameters will include PRESS DWELL DOWN and PRESS DWELL UP or PRESS DIE BOOST depending on the machine's configuration. The press outputs can also signal the AMS 3840 power module (or similar unit) or isolation relays for higher voltage solenoids.

Like the shear output, the **PRESS DWELL DOWN** can be programmed from .000 to 0.999 seconds. A **PRESS COMPLETE** input will override the press's timed output and turn off the output immediately upon detection. In some applications, a 0.0 second time can be programmed if a PRESS COMPLETE is used. If a press complete is not detected within ten seconds, then the run output is turned off. The **PRESS DWELL UP** will time out as programmed regardless of the press complete input. See Figures 2.4 and 2.5.

Chapter 3: Machine Configuration

Initial Power Test

Before plugging in the connectors to the controller, turn on the power and check for the proper voltage on the connectors. For the panel mount version, be sure that the polarity of the 24 VDC is correct. On the two console models (AC and SL), check for 115 VAC from pin J to both pins K and L. Also check for 0 VAC from pin K to pin L, this will ensure that the unit is properly grounded.

With the proper voltage checked on the connectors, turn the power off and plug in the connectors. Reapply power and look for the display to light up after a few second delay. The display should be similar to the one in figure 3-1, below.

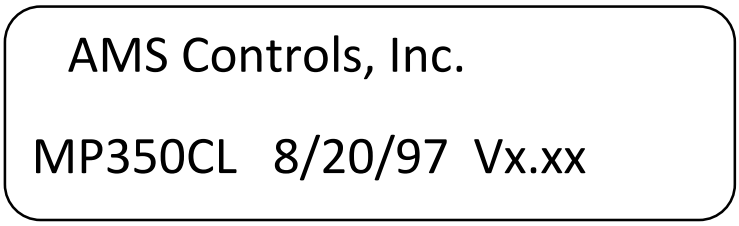

Figure 3-1 Initial Display at Power Up.

Make a note of the Version Number that is shown on the display. Write the number on the data sheet that is shown in the Appendix of this manual. If you call AMS Controls with questions or for assistance, you may be asked for this number.

Configuration Programming

Before the controller is initially powered up, the customization dip switches on the back of the controller must be set. Refer to Chapter 7 for a description of the switches for the model of controller to be installed. If the switches are changed with power on, the power must be cycled so the controller can recognize the switches have been changed. Memory will be cleared if parameters are entered and then switches are changed.

In addition to setting the customization switches, the user can further customize the **MP300CL SERIES** by programming parameters in the Configuration mode. If

the customizing switches have been changed, the **MP300CL SERIES** will erase all memory and go immediately into the Configuration mode.

The Configuration mode can be entered from the Status Screen by pressing the SETUP key until the following screen is displayed, and then by pressing the "4" key.

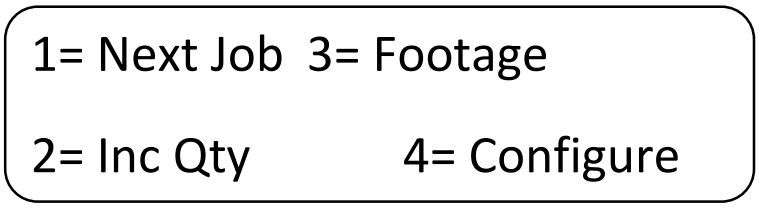

Figure 3-2. Next Job, Inc Qty, Footage, Configure Screen

Some of these parameters are general and apply to all switch settings while others apply only to certain switch settings and certain controllers. In this section, all of the possible setup parameters will be defined. The SETUP SHEETS in the back of the manual will show the specific parameters for each possible switch setting in a table form so that you can fill in the values for your particular installation.

General Parameters

When the controller is first energized, the memory has been cleared, or the Configure option is selected when viewing figure 3-2, the Configuration Screen will be displayed on the controller. The setup parameters can then be edited and saved in the controller when the ENT key is pressed.

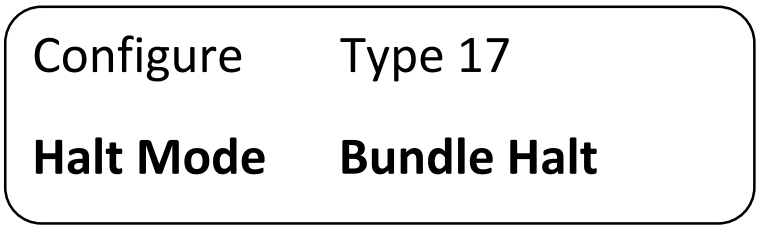

Figure 3-3. Configuration Screen

Halt Mode (Except MP301CL and MP301HCL)

Determines when the controller will execute an automatic line halt. The user has the choice of going from one item to the next without stopping, stopping after the completion of a bundle, or stopping after the completion of an order. The HALT MODE has three options

1. BUNDLE HALT (default)
2. AFTER JOB
3. DON'T HALT

In the BUNDLE HALT mode, the controller will not halt the machine at the completion of a job if the next consecutive job number has been programmed with a quantity and a length. This feature can be used to create automatic bundle stops by simply skipping a job number when a bundle stop it required.

When the AFTER JOB mode is selected, the controller will halt the machine after each batch is completed.

In the DON'T HALT mode, the controller will not halt the machine at the end of a batch as long as there is another batch ready to run. The batches need NOT be programmed with consecutive Job Numbers. The controller will not halt until ALL batches are done.

To toggle through the choices, use any number key, and when the correct choice is visible, press ENT to lock in your selection.

Refresh Done Job?

If NO is selected here, when a job is finished, its remaining quantity is left at zero; if YES is selected, the remaining quantity is reset to the quantity programmed, so that the job can be run again without manually reprogramming it.

To select the desired mode of operation, press any number key to toggle the display between NO and YES. When the correct choice is visible, press ENT to record your selection.

Batching (MP301CL and MP301HCL only)

Batching can be used as a convenience to users who wish to produce parts without ever stopping the line. If the setup parameter is set to "NO" the operator is only asked for a part length whenever he programs a job. There is no need to enter a quantity. On the next valid Run input, the **MP301CL** or **MP301HCL** will begin production on the programmed length and continue running until the line is manually halted.

Set Batching to "YES" for normal **MP301CL** operation. Press any number key to toggle the response from "YES" to "NO" then press ENT to record your selection.

Halt No Parts to Run (With Punch Only)

If YES is selected, the controller will halt when all remaining parts have been loaded into the controller's memory. At this time it is desirable to program more orders so that scrap is not produced. If NO is selected the controller will not halt when all parts are loaded into memory and thus may produce scrap when more orders are run.

Shear Dwell Down

SHEAR DWELL DOWN is the time it takes for the shear to move from the top of the stroke to the bottom of the stroke. The range of time allowed is 0.000 to 9.999 seconds and can be set to the nearest millisecond. If a SHEAR COMPLETE switch is wired in, the SHEAR DWELL should be set to zero. When the SHEAR COMPLETE switch closes, the SHEAR DWELL time will be overridden and the output will be turned off immediately.

Note: To ensure that a feed-to-stop line is not restarted until the shear complete switch has closed, it is possible to enter a SHEAR DWELL TIME OF ZERO. With a zero entered the controller will interpret this as "do not restart the line until the complete switch closes." If the complete input is not made within 10 seconds, then the line is halted. A non-stop line with a SHEAR DWELL OF ZERO, will run normally as long as the shear complete is activated after a shear. If the shear complete is not activated the machine will continue to run for ten seconds, stop, and will not restart.

A programmed time greater than zero will give a timed output according to the SHEAR DWELL TIME or turn on until a SHEAR COMPLETE is seen, whichever comes first.

Shear Dwell Up

SHEAR DWELL UP is the time necessary for the shear to return from the bottom to the top of its stroke.

Shear Deadband

The SHEAR DEADBAND provides a programmable delay between turning OFF the Shear Down output and turning ON the Shear Up output. The delay occurs any time the shear is fired including all run, test, and manual modes. A SHEAR DEADBAND of zero disables the delay, and up to a 9.999 second delay may be entered.

Shear Kerf

The SHEAR KERF is defined as the amount of material removed when the shear cycles. Some cutoff dies have two cutting edges that blank out a slug of material. Shears that have a cutting action similar to a pair of scissors would use a kerf value of zero. For other types of dies or saws, the SHEAR KERF should be set to the length of the slug removed. This length is added to the length of each part programmed so that the resulting part length will be correct. The maximum SHEAR KERF is 10.0000 inches.

Shear Reaction

The SHEAR REACTION time can be used in high-speed flying die applications to reduce the overall stroke length of the cut cycle. Without a reaction time, the **MP300CL SERIES** controller waits until the die has moved to the MINIMUM DIE DISTANCE and the part is in tolerance, before the Shear Output is turned on. The SHEAR REACTION time causes the controller to turn on the Shear Output early, allowing time for relays to activate and solenoid valves to energize. The tolerance test is performed at the end of the Shear Dwell Down signal (after the part has been cut). A SHEAR REACTION of 0 to 0.5 seconds is allowed, but the user should note that the Shear Output will not be turned on before the die has started its acceleration ramp.

Also note that the SHEAR REACTION time is only in effect when the parameter ON TOLERANCE ERROR is set to “Cut & Stop” or “Warn Only”.

Minimum Part

The MINIMUM PART defines the length of the shortest piece the **MP300CL SERIES** controller will be allowed to make. For some applications short part lengths may cause problems for the roll former or other tooling. By setting a value for the MINIMUM PART, the user will not be allowed to program any

items which make parts shorter than this length. Any value from 0 to 999.999 inches may be entered.

Delay After Shear

This parameter allows the operator to create a separation between parts. The line remains stopped for this amount of time after the shear has cycled. Increase this time to produce a longer pause between parts up to a maximum of 60.0 seconds. For no pause, enter zero. This parameter is not applicable when the LINE MOVEMENT parameter is set to RUN.

Important Notice:

The customer is responsible for adequate safety devices as well as visual and audible indicators to prevent personnel from potential hazards. The long time delay that is allowed must not be confused for a machine-off condition.

Line Movement

Used on flying die lines only, the LINE MOVEMENT parameter determines whether the forward output will be used to move the material or if the run output will be used to move the material. Pressing any number key will choose between Fst/Fwd and Run. The main difference between the two options is that when the line is halted, the run output will turn off immediately while the coast to stop occurs. Whereas the Fst/Fwd selection leaves the run output on during the coast-to-stop time.

Time Per Part

The setup parameter TIME PER PART (seconds) is used on stopping lines. TIME PER PART is used for machines that need to produce parts at a constant rate (for the sake of down stream operations). With this setup value programmed, the controller will vary the velocity of the line to produce each part in the specified time (regardless of length). The MAX VELOCITY is the upper limit of the line speed and the JOG VELOCITY is the lower speed. If this parameter is zero, the MAX VELOCITY is used regardless of the length.

Press Down (With Punching Only)

For each press on the machine, a dwell time is programmed. This sets the time duration of each press cycle in seconds. PRESS DWELL DOWN is the time it takes for the press to go from the top of its stroke to the bottom. The range of time allowed is 0.000 to 9.999 seconds, and can be set to the nearest millisecond. The PRESS DOWN time will be overridden by the closure of a PRESS COMPLETE switch if one or more of those inputs are used.

Press Up (With Punching Only)

PRESS DWELL UP is the time it takes to return from the down position to the up position.

Scrap Length (With Punching Only)

When a new coil is loaded with the material threaded through the shear, the **MP** controller may not be able to immediately produce the next order without incurring some scrap. The next potential part may be past a required punching station and therefore cannot be made. To solve this problem, the AMS controller will insert shear only parts until the next normal part is beyond the first required punch operation. The length of these shear only parts is determined by the SCRAP LENGTH parameter.

The user can set this parameter to produce usable parts or lengths that are at least easy to handle. For example, if your SHEAR TO PUNCH DISTANCE is 300" and the SCRAP LENGTH is set to 120," the XL controller will make 3 pieces that are 120, that you may sell without holes. If a SCRAP LENGTH of zero is entered, the controller will produce scrap pieces at the part length of the current order.

Shear-Punch (With Punching Only)

The SHEAR-PUNCH DISTANCE is the physical length between the shear press and the punch press. The largest acceptable value is 1000.0 inches.

Loop Gain

LOOP GAIN is a parameter which sets the sensitivity of the servo loop. Lowering this number will make the drive less responsive. If it is too low, the system will be sluggish. Raising this number will make the system more sensitive and responsive. If the LOOP GAIN is too high, the system will become unstable and oscillate. Great care should be used in changing this number. **Make gradual changes**.

Jog Select Mode

Used on flying die lines only, the JOG SELECT MODE determines what the Jog Forward and Jog Reverse inputs will control. With LINE selected the inputs will jog the material. With DIE selected, the inputs will jog the die motor.

Jog Velocity

The speed that the rolls turn on a feed-to-stop machine is set by the JOG VELOCITY. On a flying die machine, the JOG VELOCITY sets the speed during die jog operations and also for referencing.

Max Velocity

MAX VELOCITY sets the maximum roll speed in a feed-to-stop machine or the maximum die return speed on a flying die machine.

Min Velocity

MIN VELOCITY sets the minimum die return speed on a flying die machine.

Acceleration

ACCELERATION sets the rate of change of velocity for either the feed rolls or the die travel. This parameter controls both the acceleration and deceleration of the forward travel for Die Accelerators.

Return Accel

The RETURN ACCELERATION sets the acceleration for the flying die to return to home after the cut has been made. This parameter typically can be set higher than the forward ACCELERATION since the die return is not a critical movement. This will decrease the overall cycle time of each cut. The RETURN ACCELERATION can also be adjusted for a lower value which will result in less wear and tear on the actuating system. Units are expressed in inches per second, per second (Inches/second^2).

Min Slow Dist

If the machine is set up as a two speed Die Accelerator the MINIMUM SLOW DISTANCE parameter will appear in the list of setups. The line will switch from fast to slow at the MINIMUM SLOW DISTANCE from the cut point. Once the line has made its cut and the die is at the end of its stroke, a calculation is made to determine if the die can make it home in time for the next cut with the line in fast speed. If it is determined that the die can not make it back home in time, the line stays in slow speed. The accepable range of values for this parameter is 0 to 50.00 inches.

Min Die Dist

The MINIMUM DIE DISTANCE defines the shortest distance from the home position that a cut can be made. With most presses, improper cutting will occur if the die is not near the center of the press, or if it is not up to the full line

speed. The MINIMUM DIE DISTANCE defines one side of this acceptable window. As the die accelerates for a cut, the die must be past this MINIMUM DIE DISTANCE and in tolerance (if a "no cut" mode is selected), before a cut can be made. This is also the place that all manual referencing will occur.

The MINIMUM DIE value must also meet the following criteria:

$$\text{Minimum Die Distance} = \frac{\text{Velocity}^2}{2 \text{ x Acceleration}} + 11\%$$

In the formula, Velocity is the expected speed of the line expressed in inches per second **(found by dividing FPM by 5)**, and Acceleration is the programmed parameter in the controller expressed in inches / second ^{2}.

The formula will produce a MINIMUM DIE DISTANCE that will allow the die to achieve the line speed prior to cutting. The die is then likely to overshoot the line speed and oscillate around the line speed for a small amount of time before becoming stabilized. Because of this behavior, some extra distance should be added to the MINIMUM DIE DISTANCE to assure a stable speed before firing the shear. If a large enough MINIMUM DIE DISTANCE is not programmed, an error will occur when trying to make a cut.

Max Die Dist

The MAXIMUM DIE DISTANCE defines the furthest distance from the home position that a shear can occur. This defines the other side of the acceptable window within the press. If the die reaches the MAXIMUM DIE DISTANCE and is not within tolerance, an error will occur. When the machine is being operated in a "no cut" mode and the tolerance is not obtained, no cut will be made. If the tolerance is obtained at the MAXIMUM DIE DISTANCE, the cut will be made. Because of this, there must be enough travel left to complete a cycle. The MAXIMUM DIE DISTANCE should be adjusted so that there is enough travel left for the die to cycle the press within the remaining travel distance.

Advance After Cut

The setup parameter ADVANCE AFTER CUT is used only for die accelerator applications. This is the distance that the die will advance after the shear down and before the shear up. It was intended to prevent the shear blade from scraping against the metal as it moves up.

Retract After Cut

The setup parameter RETRACT AFTER CUT is used only for roll-feed applications. This was added to prevent the shear blade from scraping against the metal as it moves up. In the case of the feed-to stop, the metal is retracted after the shear down.

On Tol Error?

Some roll form manufacturers would prefer to have the controller cut an incorrect part when an error occurs, instead of having to handle a large amount of material past the shear that cannot be easily reversed. They would prefer that the line be stopped and have the operator inspect the part to determine if it is unusable. On the other hand, other users may be concerned with a possible speed mismatch if a cut is made on an error.

When the controller detects that a part is about to be made outside of the specified tolerance range, the operator has four options:

1. If STOP NO CUT is selected, the controller will display an error message and stop the line without making the cut.

2. If CUT & STOP is selected, the controller will make the cut, then stop the line and display an error message.

NOTE: WARN ONLY and WARN NO CUT are special cases which will drastically affect the operation of your machine. This option is commonly used for extrusion lines. Consult AMS Controls before using a WARN mode.

3. If WARN ONLY is selected, the controller will make the cut without stopping the line. An error message will remain on the display until it is cleared by the operator, but the line will continue to run.

4. If the fourth option WARN NO CUT is selected, the controller will prompt the operator with an error message, but the line will not stop and the cut will not be made. Operators should be very cautious when using this option. If several parts in a row are out of tolerance, a large amount of uncut material beyond the shear can build up very quickly.

When the WARN modes are used on extrusion lines the following differences will be seen:

Manual Crop- When attempting to perform a manual crop in a WARN mode, a standing cut will not be made. The controller will find the Home Switch without making a crop.

Auto Crop- After the Manual Shear button is pressed the controller will then be in the Auto Crop mode, and the machine will then make a flying crop at the MINIMUM DIE DISTANCE.

When the WARN ONLY mode is selected, the tolerance is checked only at the bottom of the stroke while the cut is being made. If the machine is out of tolerance, a warning is given but the machine will continue to cut the parts.

When the WARN NO CUT mode is selected, the tolerance will first be checked at the MINIMUM DIE DISTANCE. If the machine is still not within tolerance by the MAXIMUM DIE DISTANCE, the machine will continue to run but no cut will be made.

Pressing any number key toggles between the four options.

Tolerance

TOLERANCE defines the acceptable band of length variation that a user will accept and defines both the upper and lower limits. For a TOLERANCE of 0.01 inch the allowable range of variation would be $\pm$ 0.01 inch. If the controller is unable to achieve a length within this band, an error will occur and the machine will be stopped (if On Tol Error? parameter is set to STOP NO CUT or CUT & STOP).

Offset Auto

The OFFSET AUTO is the voltage required to hold the feed rolls or the die accelerator motor at a stopped position, with no drift in either direction. This parameter is automatically adjusted by the AMS controller, but it can be changed by the user. This would only be done if the initial value is grossly off, and it would take too long for the controller to integrate out the error. The more common usage of this parameter is for monitoring the amount of offset, and making external balance adjustments to the drive. This parameter should be as close to zero as possible to give the controller the maximum control range.

Offset Integral

The OFFSET INTEGRAL defines the integral time constant for the removal of position error (DRIFT), when the closed loop servo system attempts to hold the die/feed rolls in a locked position. An OFFSET INTEGRAL time constant of 100 seconds is recommended and is the default value.

Lag Auto

LAG AUTO (COMPENSATION) is the integral that is used to correct for a condition where the speed is matched, but the position lags behind the target. This parameter is automatically adjusted and is not normally changed by the user. If this value becomes unstable, there may be a problem in the system. If the value becomes too large, an error message “E-stop Max Lag” will be displayed.

Lag Integral

A Die Accelerator parameter, the LAG INTEGRAL defines the integral time constant for the removal of position error (Lag) when a flying die attempts to track a moving target. A LAG INTEGRAL time constant of one second is recommended for systems using responsive DC servo motors. A longer time constant may be necessary when using slow-to-respond hydraulic systems.

Derivative

This parameter is used in special application loop control systems. On systems that use hydraulics or have a lot of inertia, it is possible that the system may have a slow response time. If this is the case, it may be possible to have a faster response by entering a DERIVATIVE value. The sluggish response of the machine will result in an error, and the purpose of the DERIVATIVE is to anticipate the rate of change in the error, and amplify the rate of change to improve performance.

If it is determined that this parameter is to be used, start with a value of 3 seconds , and then decrease the value until a change in pitch or “hum” is heard in the motor which indicates that the controller is overcorrecting the error. When this occurs, increase the value until the system stops oscillating.

CAUTION:

Changing this value will amplify any noise in the system, as well as the error, which can cause problems in the system. This parameter may also increase the tolerance of the system which could cause variation errors. Entering a zero for DERIVATIVE will disable the parameter.

Job Comp. Time

This sets the length of time the batch complete output will remain on at the completion of each line item. This output can be useful on pre-cut lines which need to keep the output drive running at the end of a batch, in order to process the last few parts. This parameter defaults to .25 seconds when the controller is first powered on and the parameter limits are 0 to 60.00 seconds.

Line Resolution

The RESOLUTION parameter defines the length of material movement for each increment of the encoder. It is a function of the circumference of the measuring wheel and the number of counts per revolution of the encoder. The formula for calculating RESOLUTION is as follows:

$$\text{Resolution} = \frac{\text{Circumference}}{4 \text{ x } \text{Encoder Count}}$$

For an AMS encoder, the encoder count is the model number of the encoder. A Model 256 is a 256 count encoder. A Model 1000 is a 1000 count encoder.

The most common wheel used has a circumference of 12 inches. For this size wheel, RESOLUTION would be as follows:

Model	Resolution
256	0.01171875
500	0.006
1000	0.003

It is not necessary to precisely measure the circumference or calculate the formula to any great precision. Nominal values can be used with precise results achieved during calibration. Values between 0.00004000 inches and 0.04000000 inches are acceptable.

Die Resolution

DIE RESOLUTION defines the value of one count from the die encoder as reflected in the movement of the die. See line resolution for more details on determining the DIE RESOLUTION.

Motor Resolution

MOTOR RESOLUTION is used with feed-to-stop, two encoder operation, and defines the value of one count from the motor encoder. See LINE RESOLUTION for more details on determining encoder resolution.

Correction Factor

The CORRECTION FACTOR adjusts for errors in the size and tracking of the measuring wheel. It is expressed as a percentage, with 100 % being no correction. Increasing the CORRECTION FACTOR causes the parts to become longer and decreasing the value will shorten the parts.

The best way to calibrate the system is to run 10 parts, carefully measure them, and calculate an average length. The new CORRECTION FACTOR is calculated as follows:

$$\text{New Correction} = \frac{\text{Old Correction x Programmed length}}{\text{Average Measured Length}}$$

This parameter is automatically adjusted when using the Calibrate Trim procedure, see page 3-19.

Filter Constant

The FILTER CONSTANT can be adjusted in order to improve accuracy. A low value should be used on machines with very stable line speeds. A high value (greater than 50 Hz) should be used when rapid fluctuations in line speeds occur. Some trial may be necessary to achieve an accurate value.

The default value is 32 Hz, which is considered to be a proper value for stable lines. The controller will allow values from 1.0 Hz to 200.0 Hz.

Units

Length measurements can be programmed and displayed as either inches or millimeters. This parameter toggles between either ENGLISH for inches, METRIC mm or METRIC cm. The ENGLISH parameter will also measure in feet and

feet/minute while the METRIC parameters will also measure in meters and meters/minute. Press any number key to toggle through the choices, and then press ENTER to record your selection

Initial Machine Tests

Directions and Polarity

Before engaging the servo drive, polarity of all encoders should be checked. It would be safest to disconnect the motor from the drive system so that no die movement can occur.

After programming the initial configuration values, press the STATUS key to get to the normal running display. The length past the shear is shown in the upper right corner of the display. This will show the relative position of the material with respect to the die. On flying die machines, rotate the line encoder in the same direction that the material moving through the machine would cause it to rotate. If the displayed length decreases, then the direction is wrong and the configuration switches must be changed. The direction of the motor encoder can be checked by moving the die forward toward the leading edge of the material. If the displayed length increases, then the direction is wrong and the configuration switches must be changed.

On roll feeders, the encoder is mounted to the motor and the rolls must be turned by hand to check the direction. Again, if the direction is wrong, the configuration switches must be changed.

After setting the encoder directions, connect the DRIVE ENABLE output so that the analog polarity can be checked. Be sure that no material is loaded into the machine. Use the JOG FORWARD switch or DIE JOG FORWARD switch, in the case of the die accelerator, to activate the drive. If the drive runs out of control, then the analog polarity is wrong, and the configuration switches must be changed.

Manual Shear

In the Feed-to-Stop mode, the shear can be manually activated using the CYCLE switch on the front panel. This causes the SHEAR output to turn on for the SHEAR DWELL time or until the SHEAR COMPLETE input switch closes. Make adjustments to the SHEAR DWELL time or the position of the SHEAR COMPLETE switch until the shear cycles properly.

In the flying die mode, a manual CYCLE function consists of a series of moves. In this mode, the die must be referenced to the machine and the material referenced to the die. When the CYCLE button is pressed, the controller seeks the closing point of the DIE RETRACTED switch. If the switch is initially open, the die will move in reverse until the switch is made then come just off of the switch and then back on it again.

If the switch is initially closed, the die will move in the forward direction until the switch opens and then it will move in the reverse direction until it closes.

Note: The cycle switch must be maintained until the shear is fired.

After the DIE RETRACTED switch is found, the die will move to the MINIMUM DIE DISTANCE from the home position and the cut will be made.

Note: With the setup parameter ON TOL ERROR? set to a WARN mode, the shear will not fire until the controller is put into run.

The die will then go to the die home position and stop. Note that since the display shows the length of material past the shear, the display should show the approximate MINIMUM DIE DISTANCE. Home position is 0.250" off the DIE RETRACTED switch. This will prolong the life of the switch.

Manual Press

When the MANUAL PRESS input is closed, the press will fire for the PRESS DWELL time or until the PRESS COMPLETE switch closes.

Make adjustments to the PRESS DWELL time or to the position of the PRESS COMPLETE switch until the press cycles properly.

Slip Test on Feed-to-Stop Machines with 2 Encoders

A system using two encoders, a line encoder riding on the material and the motor encoder feedback, will perform a slip test when the controller is in the run mode only. The motor encoder feedback is used when jogging. For a controller to display a MAXIMUM SLIP ERROR, the following conditions must be true:

1. The velocity from at least one of the two encoders must be greater than 10 FPM.

2. The difference in velocity between the two encoders must be greater than 50 % of the motor encoder velocity for at least 0.25 consecutive seconds.

If all of the conditions above are satisfied, the controller will display a "Maximum Slip Error" and shut down the control loop. The operator may then initiate another JOG or RUN without clearing the error message.

Testing Without Material

Feed-to-Stop Mode (Single encoder only)

Since feedback comes from the encoder on the motor, it is easy to test the system without material by just programming an order and running it. Start with the TOLERANCE set to about 1 inch and a 5 second DELAY AFTER SHEAR. This will avoid OUT OF TOLERANCE errors until parameters have had a chance to adjust themselves. The long delay will allow time for the error to be read at the end of each cycle. After stable operation is achieved, LOOP GAIN, MAX VELOCITY, and ACCELERATION can be adjusted to optimize performance.

When using a two encoder setup, the feed rolls can only be jogged without material. Trying to run without material on a two encoder system will result in a MAXIMUM SLIP ERROR.

Die Accelerator Test Mode

Normal operation cannot be used to test performance without material since the line encoder must be turning. To handle this situation, a DIE TEST mode has been included.

From the Status Screen, continue to press the SETUP button until the following screen appears. Press the number 2 key to enter the Die Test mode.

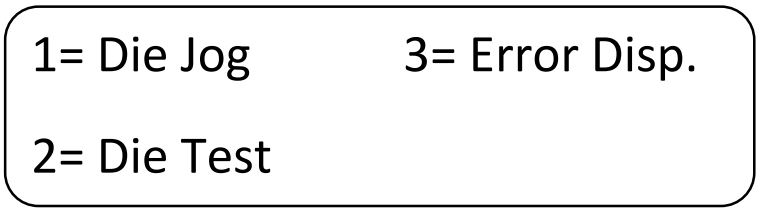

Figure 3-4. Die Jog, Test, and Tolerance Error Screen

The DIE TEST program will ask for the length of part to be run along with the line velocity that is to be simulated. When run, the **MP300CL SERIES** will generate line encoder pulses in proportion to the programmed speed. The system will function normally with the exception that the forward and run mill outputs will not be turned on and an error will not occur nor will the shear cycle if tolerance cannot be achieved. While running, parameters such as LOOP GAIN, ACCELERATION, and TOLERANCE can be adjusted to achieve optimum performance.

Caution: Do not change Resolution or Correction Factor while operating in this mode!

Calibration

After good performance is achieved in tests without material the machine can be loaded and actual parts run to check for calibration. Short length parts can be run to verify consistent lengths.

After repeatable lengths are achieved, the system can be calibrated. The longest possible part size should be run. If short parts must be used, try to use a vernier caliper for the measurement. If parts longer than 4 feet are run, the only practical measuring device is a steel tape. Verify the accuracy of these devices by comparing several steel tapes measuring the same object. The ends of these tapes can be damaged and give bad readings. If this is questionable, have someone hold the tape carefully on the one inch mark and subtract an inch from each measurement made.

The best way to calibrate the system is to run 10 parts, carefully measure them, and calculate an average length. The new CORRECTION FACTOR is calculated as follows:

$$\text{New Correction} = \frac{\text{Old Correction x Programmed length}}{\text{Average Measured Length}}$$

For machines with a punch press, if parts are being made at the correct programmed length but the punch spacing from the leading edge is incorrect, a simple adjustment to the SHEAR-PUNCH distance may solve the problem. Load the machine until there is material under both the punch press and the shear press. Manually cycle both presses, then jog the material forward until the punched hole is beyond the shear and cut it off. Now accurately measure the

length from the leading edge of the material to the reference point of the hole or pattern and enter this length for your SHEAR-PUNCH distance.

Calibration Trim

The **MP300CL SERIES** controller's CALIBRATE TRIM feature automatically computes a new CORRECTION FACTOR which will be used in the controller's length calibrations to adjust for errors in the size of the measuring wheel. From the Status Screen continuously press the SETUP key until the following screen appears. Press the number "1" key to enter the Calibrate Trim mode.

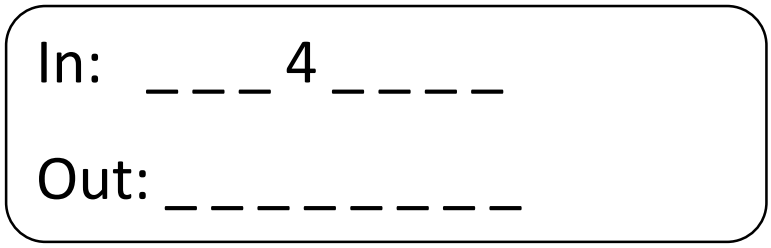

Figure 3-5. Input/Output Status Screen

The controller remembers the programmed length of the last part cut and asks the user to enter the actual measured length. The controller then calculates a new CORRECTION FACTOR and asks the user if he would like to update the current value with the new value.

Input/Output Status

This mode allows you to view the current status of all the **MP300CL SERIES** controller's inputs and outputs. This can be very helpful in troubleshooting the system during and after an installation. To view the I/O screen, press the SETUP key until figure 3-5 appears, and then select the number for Input/Output. The number of the active input and/or output will appear on the display, figure 3-6.

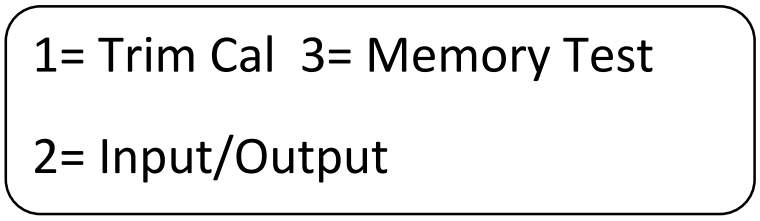

Figure 3-6. Trim Cal, Memory Test, I/O Screen

Memory Test

This causes the **MP300CL SERIES** to enter a self-test mode in which it verifies all internal memory "chains." If no errors are reported, all memory can be considered good.

Do not clear the memory unless you have written down all Setup, Pattern, and Order information for re-entry.

If you are experiencing controller problems, it is not recommended that you clear the memory unless you have made extensive troubleshooting checks (see the section in the back of the controller manual titled **"In case of a Problem"**). The steps listed include: making sure you have checked the encoder, the shear, the calibration procedure, rechecked setups, used the built-in diagnostic features, checked the incoming power, and cycled power off and on.

You can clear all storage in the **MP300CL SERIES** (including Setup and Order data) by following this sequence: **(1)** make sure that the Security switch is unlocked; **(2)** turn off power to the controller; **(3)** wait five seconds; **(4)** press the '5' key while you **(5)** turn the controller's power back on; **(6)** hold down the '5' key for at least five seconds after you turn the power on.

Input / Output Description

Inputs

The inputs described are the common inputs for all **MP 300 CL Series Controllers**. Each control will use a combination of, or all the inputs described.

Jog Forward

This input is from a momentary switch and is used to jog the material of the line forward. The correct functioning of this input is determined by controller parameters and the connection of the output of the controller to the driving device.

Jog Reverse

This input is from a momentary switch and is used to jog the material of the line in reverse. The correct functioning of this input is determined by controller

parameters and the connection of the output of the controller to the driving device.

Safety Interlock/Remote Run

This input is normally from a switch or dry contact of a relay. When closed, the controller is placed in the Run mode to make parts. When open, the controller is in the stop mode of operation. To be in the Run mode, other conditions must be met in the controller, such as orders being programmed. If the controller is not programmed, or if an alarm condition exist, the control will not go into the Run mode.

Shear Complete

The shear complete is an input that will go momentarily closed when the shear is at the bottom of it's stroke. This can be from a limit switch, a proximity switch or similar device. The use of the input is optional. It's function is to remove the shear dwell down signal to the solenoid earlier for quicker response and to insure that the shear is not over-driven down.

Setup Lockout Input

This input will normally be in the form of a security key and will keep the operator from changing critical parameters on the controller. If an operator attempts to change the "Locked out" parameters, the following message will be seen: **"Error! The Setup Lockout switch is on. The Setup parameters have been locked out. See maintenance for assistance in programming this item".** The SETUP LOCKOUT input does NOT lock the operator out of the following parameters:

1. Halt After Item
2. Halt No Items to Run
3. Delay After Shear
4. Units of Measure

Die Retract

This input will normally be in a form of a limit switch wired normally open. When used with the die accelerator it is used as a home input. When the controller receives this input it knows that the die is in the "HOME" position. This input should remain on until the die is moved in the forward direction off the switch.

Feed OK

This input is used with Feed to Stop lines, it is used to tell the controller to feed more material when all feed conditions are met. When the controller receives this input it feeds more material. This input can be either a limit switch or a photo eye depending on the application. Some common input devices include Loop Detectors, Press Position, Process control output from some device downstream.

Hole Detect

This input is a normally open photo eye switch. When the material passes between the eyes and a hole is present they "see" each other and the input comes on telling the controller to count the hole.

Manual Shear

This is a momentary switch input. This input is used to cycle the shear and manually cut parts when the input is closed.

Outputs

The outputs described are the common inputs for all **MP 300 CL Series Controllers**. Each control will use a combination of, or all the outputs described.

Slow/Reverse/Run/Forward

These outputs are used to move the material and to give indication that the material is in motion. The outputs to be used will depend upon system design and the selection of the LINE MOVEMENT parameter.

Shear / Punch

The shear and punch outputs are connected to the solenoids that drive these devices in a downward state. This output is a timed output, programmed into the control.

Drive Enable

This output is used to enable the drive for the feed rolls or the die accelerator depending on the application. When an input to move the material or the die is given the controller enables the drive to control the motors attached to these devices. This output will remain on until an E-Stop condition or loss of power occurs, then it will go off.

Batch Complete

This output is used to turn on some aux device like a exit conveyor to move the completed parts to another location once the batch is complete.

Shear Up

The output is connected to the solenoid that controls this function will become energized by the output for a pre-programmed amount of time.

Punch Up

The output is connected to the solenoid that controls this function will become energized by the output for a pre-programmed amount of time.

Chapter 4: Operating Procedure

Entering Orders

An order consists of a Job Number, a Quantity, a Length, and if a punch is used, a Punch Option. Depending upon the type of controller, one or several orders can be entered into the controller at one time. The ability to program more than one job at a time gives the user the potential to change sizes without stopping the machine. This saves time on short runs. The **MP301CL** controller is a single batch controller only. When programming this controller, the only parameters are Quantity and Length.

The efficiency of a multiple batch controller can be lost if the controller is not easy to program and understand. The AMS controller solves this problem with it's clear and concise method of programming.

Programming the **MP300CL SERIES** controller is a simple matter of keying in data in answer to a flashing prompt. The ENT key is a "take it" command from the operator to the controller, meaning the currently displayed value is stored into memory when the ENT key is pressed. The ENT key can also be used to move the cursor from one field to another when reviewing data already programmed. Note that you must use the ENT key to enter new or altered data into memory.

Changes are made by simply writing over the old value. Pressing the first numeric key causes the old value to be erased and the new numbers to shift in from the right. In case of a mistake during an entry, press the CE (Clear Entry) key to erase the entry and start over. A new correct value can then be keyed in. When the correct value is displayed, press the ENT key to move to the next field.

Job Number (Except MP301Cl or MP301HCL)

Enter the Programming Mode by pressing the PRG key. The first data item to enter is the Job Number, indicated by the flashing display. The controller will assume that you wish to program the next job number after the last one that was programmed. If Jobs 1 through 10 have been programmed, the Job Number displayed will be Job 11. This is merely a suggestion by the controller. You may enter any Job Number from 1-999. If you entered Job 1 through 10, you may review and correct Jobs previously programmed. Press the ENT key to confirm the present Job Number.

The Job Number can be used to create bundle stops. When using the "Bundle Halt" mode, the **MP300CL SERIES** controller can be made to go from one job to the next without halting the line provided that the Job Numbers are consecutive. If you wish to insert bundle stops, skip a job number between bundles. In the following example, bundles have been set up on intervals of 10 jobs, even though there are fewer than 10 jobs per bundle. The machine will halt after completing jobs 5 and 13. Refer to the Setup parameter HALT MODE for more details on setting bundle stops.

Job	Quantity	Length
1	15	144.000
2	10	120.000
3	12	96.000
4	16	72.000
5	20	60.000
11	10	168.000
12	32	156.000
13	9	148.000

If a punching pattern is used, the punching option will be shown. In the punching example below the machine will halt after completing jobs 23 and 34.

Job	Quantity	Length	Option
21	2	180.000	Even
22	30	174.000	Rand
23	42	162.000	No P
31	25	150.000	No P
32	17	90.000	Rand
33	25	122.500	No P
34	50	135.000	Even

Quantity

After the Job Number is entered, the Quantity will be flashing. Simply key in the desired quantity and press ENT to confirm the number. If you enter a quantity of 0 on a previously programmed job, that job will be erased.

The Quantity can be set from 1 to 9999 pieces. If the quantity entered is **exactly** 9999, when this item is run, the controller will run this length until it is stopped manually, without decrementing quantity. This feature is provided for those who need to simply fill a bin with parts of a fixed length. The controller will continue to add the total number of pieces made along with the total footage used under the Footage screen in the Setup Menu.

Length

After the Quantity is programmed, the Length field will be flashing. Enter here the finished length of the part to be made (do not count the shear kerf; the controller will automatically add in this amount, if any). Enter the length in whatever Unit format was selected when the **MP300CL SERIES** controller was installed. The longest length the AMS controller will accept is 3500.000".

When entering lengths, no leading or trailing zeros are required. The following entries (in Decimal Inch mode) each produce the same 10-inch part:

10

010

10.

10.00

10.000

Punch Option (MP350PCL Only)

After entering a length, the user is prompted to enter a Punch Option. Pressing any number key toggles between three options:

1. No P - No punches
2. Rand- A random punching pattern
3. Even- Evenly spaced punches

No P (No Punches)

Select this option to make shear only parts when no additional punches are required.

Rand (Random Punches)

Select “Rand” to make parts with one or more randomly spaced punches. The display will look similar to the one shown in figure 4-1.

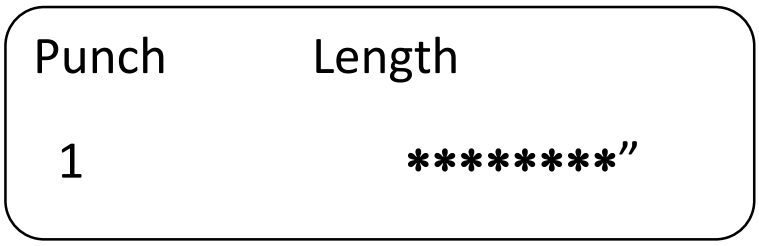

Figure 4-1. Random Punching Display

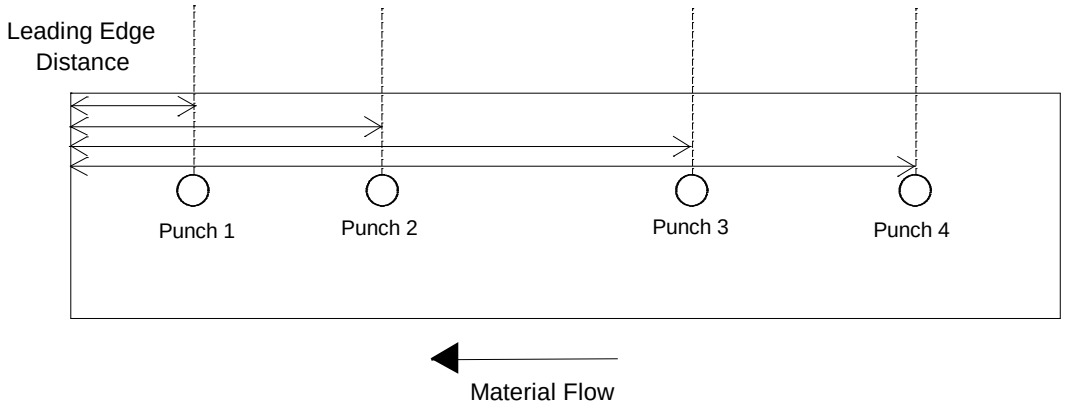

Figure 4-2. Random Punching Pattern.

Press ENT to confirm Punch #1 the first punching operation. Now enter the length at which the first punching operation should be made. This length (and all punch lengths), are measured from the leading edge of the part. For example, when entering the length for Punch #2 (the second punching operation), of 24 inches, the punch will occur 24 inches from the leading edge of the part, not 24 inches from Punch #1. Repeat for as many punches needed (up to 300) for this part length. When all of the punches have been entered, press the asterisk (∗) key to enter more jobs.

Even (Evenly Spaced Punches)

Select “Even” to make parts which have evenly spaced punches throughout the part length. The display will look like the one shown in Figure 4-3

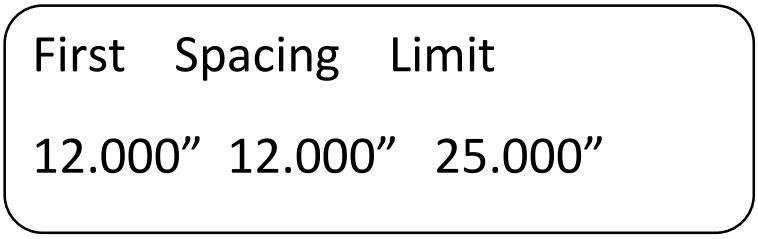

Figure 4-3 Even Spacing Display

While “First” is flashing, enter the length at which the first punching operation should occur. After pressing the ENT key, “Spacing” will start to flash. Enter the desired center to center punch spacing. For example, if 12 inches is programmed for Spacing, punches will automatically be placed on 12 inch centers. After Spacing is entered, “Limit” will start to flash. Enter the distance from the trailing edge on the part beyond which no punches are desired. For example, if 25 inches is programmed for the “Limit”, no punches will be placed within 25 inches from the end of the part.

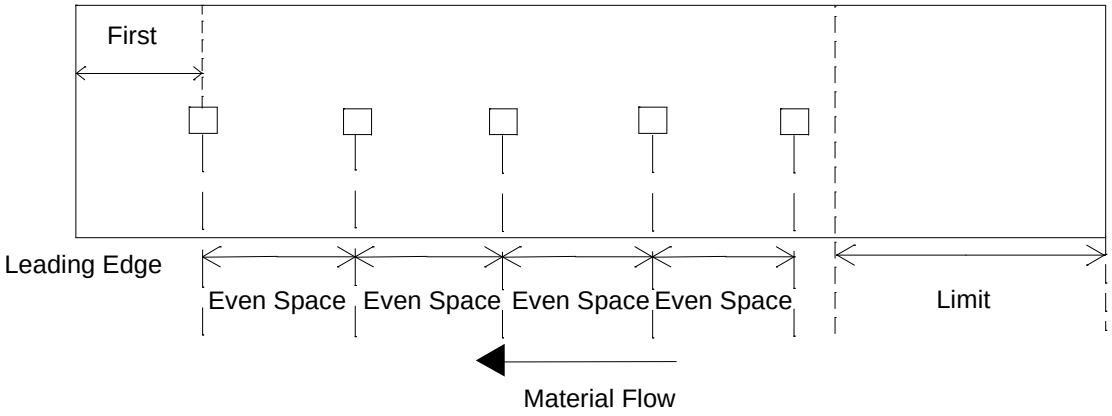

Figure 4-4. Even Space Punching Pattern

See figure above for a visual description of “Even Space” and “Limit”. After the Limit is entered press the (∗) key to enter more jobs.

Reviewing Programmed Jobs

It is possible, at any time, to review the jobs which have been programmed. While in the PROGRAM MODE, PRESS the SETUP key to step through the jobs in

descending order, or press the PRG key to step through the jobs in ascending order.

Exiting the Program Mode

The (∗) key is used to exit the PROGRAM mode and revert to the normal running display. It is also used to exit the SETUP mode.

Referencing Controller to the Material

The **MP300CL SERIES** controller measures relative movement of the material through the machine and has no way of measuring the absolute amount of material that is past the shear. In order to cut accurate lengths, the controller must know how much material is past the shear at some point in time and then it can make relative measurements thereafter. This is a process called referencing.

Referencing is simply loading material into the machine past the shear and closing the MANUAL SHEAR input switch. At the bottom of the shear stroke, the length counter is set to zero and the controller is referenced. On an **MP350PCL**, if there are FILLED parts in the controllers queue, the shear must be cycled *twice* to reference the AMS controller. The controller will remain referenced as long as the encoder stays in contact with the material and the material does not move while the controller is turned off.

On Feed-To-Stop machines, the **MP300CL SERIES** controller re-references itself to the material on each automatic cut at the bottom of the shear cycle. This is done to improve accuracy. The material can overshoot or undershoot the shear point on each feed.

With simple electronic counters, an overshoot on one cut followed by an undershoot on the next cut will cause the second part to be short by the sum of the overshoot plus the undershoot. By re-referencing the controller during each cut, the controller will limit the error to either an undershoot or an overshoot which effectively cuts the error in half.

Running the Machine

Status Display

The Status Display will vary, depending upon which model AMS controller that you have. Figure 4-6 shows the display for the **MP301CL.**

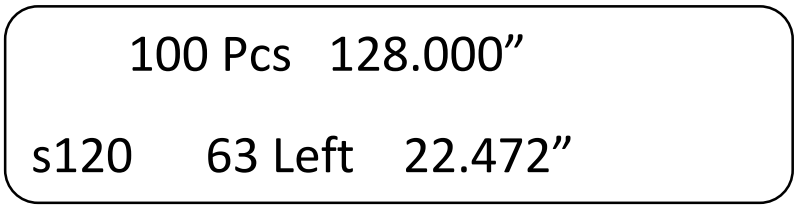

*Figure 4-6. Typical **MP301CL** Status Screen*

The top row shows the programmed quantity of the current order and the length of the part to be made. The bottom row shows the machine speed in feet per minute (or meters per minute), the quantity remaining in the order, and the current length past the shear.

Figure 4-7 shows the display for the **MP350CL** and **MP350PCL** which have the capability of performing multiple jobs**.**

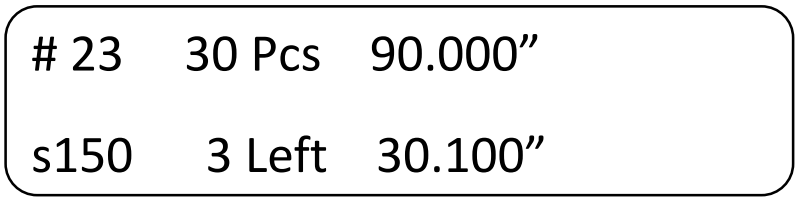

*Figure 4-7. **Typical MP350CL** and **MP350PCL** Status Screen*

The top row shows the current Job Number, the programmed quantity of the current order and the length of the part to be made. The bottom row shows the machine speed in feet per minute (or meters per minute), the quantity remaining in the order, and the current length past the shear.

Setting the Next Job to Run (Except for MP301CL)

If the Job Number shown in the upper left hand corner of the Status Display is not the job that you wish to run next, press SETUP and then select the number

for NEXT JOB. The controller will prompt the operator “Set Next Job to Run After Current One”.

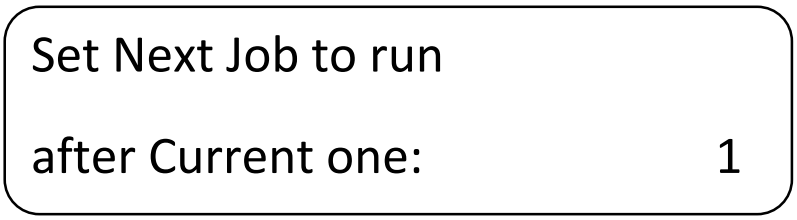

Figure 4-8. Set Next Job to Run Screen

Enter the desired Job Number and press ENT. If the machine is halted when the NEXT JOB function is entered, then the new Job Number that was entered will begin as soon as the machine is placed in RUN.

If the machine has the punching option and the original Job Number is still displayed even though a new NEXT JOB number has been entered, one or more parts from the original job have already been stored in the controller’s memory and must be made next to avoid making scrap. After these parts are made, the machine will halt and the new NEXT JOB will be ready for production.

If the machine has the punching option and the operator desires to halt the current job that is running and immediately begin making parts from a different job, these steps must be followed.

1. Halt the machine.
2. Manually cycle the shear *TWICE* to eliminate the parts which have already been FILLED.
3. Set the NEXT JOB TO RUN as described above.
4. Press the RUN input switch.

Doing this may cause one or more scrap pieces to be generated.

If the machine is running at the time, the operator is asked to “Set the Next Job to Run After the Current Job.” If the operator enters a valid Job Number, he/she will then be asked “Change Job Now (YES/NO)”. If NO is selected, the controller will complete the current job and then be ready to run the new NEXT JOB that the operator selected. If YES is selected, the controller will complete the parts from the current job which have already been loaded into the queue and then immediately change to the new NEXT JOB that the operator selected.

Starting the Machine

After the NEXT JOB is set, the machine is placed in the RUN mode by pressing the RUN switch on the front panel or by closing the external RUN contact if the REMOTE RUN option is selected. The **MP300CL SERIES** controller will begin shearing parts to the programmed length and decrement the quantity remaining for each piece cut.

When the quantity remaining reaches zero, the controller may or may not begin production on the next consecutive job number with out halting, depending upon the HALT MODE that was selected while configuring the machine.

Halting Production

At any time, the operator can halt the line by opening the Run contact. Depending upon how the controller is installed, this may take the form of pressing any of a number of HALT buttons located on the machine. The forward output (and the run output if the setup parameter “Line Movement” is set to Run) will be turned off immediately but the **MP300CL SERIES** controller will remain in the RUN mode until the material has stopped. This allows for an automatic cut to be made as the material decelerates.

The controller will remain in the RUN mode until the material has stopped or 3 seconds have elapsed. Normally, the operator would halt the machine just after a shear is made and a cut would not occur during deceleration. If the RUN contact is opened while a press is operating, the movement outputs will remain on until the press has completed its cycle (SHEAR or PRESS DWELL time).

Monitoring Production

The **MP300CL SERIES** controller has three footage totalizers available for monitoring production. The totalizers show the amount of footage that has gone past the shear as well as the total number of parts cut since the last time the totalizer was cleared.

To access the footage totalizers from the normal running display press SETUP, until the following display appears:

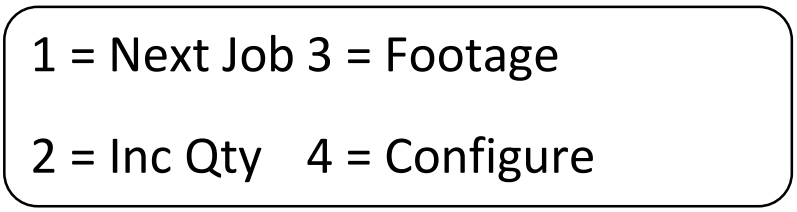

Figure 4-9. Next Job, Inc Qty, Footage, Configure Screen.

Pressing the number for FOOTAGE will allow the totalizer screens to be viewed and/or cleared. Pressing the ENT key steps the user through the three totalizers.

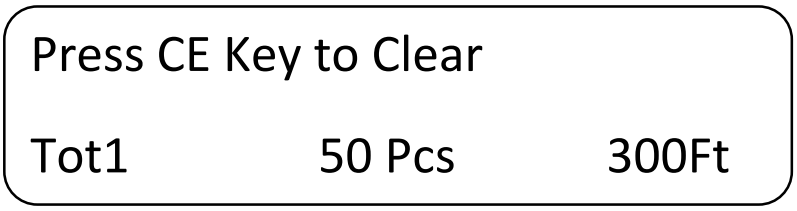

Figure 4-10. Totalizer 1 Screen.

The three totalizers are independent of each other and can be used for any purpose. One suggestion for their use would be to use one for totalizing footage used on a coil, one for footage used on a customer's order, and one for the total footage run during a shift.

Clearing these totalizers back to zero at the proper time would be the responsibility of the operator. The controller will prompt the user to "Press CE key to Clear" as the totalizers are being displayed. If Metric units are being used instead of English, the totalizers will display the totals in meters. The (∗) key returns the user to the STATUS display.

Special Procedures

Changing Coils

The following procedure should be used when changing coils to ensure proper accounting of the material used on a coil and an accurate first part after the new coil is loaded:

- If the coil has been completely consumed or the material has been cut free of the stock reel, as is the case with most roll formers, feed the material through the shear in the forward direction and dispose of the scrap piece.
- On a cut-to-length machine with no roll former involved, all of the unused material can be rewound on the mandrel for later use. In this case, back the material out through the entrance end of the shear until it is out from under the encoder.
- After the machine is empty, press the CYCLE switch on the front panel. This registers all material used to the totalizers.
- Press SETUP, and then the number for FOOTAGE. Press ENT to step though the totalizers used to record the amount of material used.
- Record the amount of material used.
- Press CE to clear the totalizer.
- Thread the next coil into the machine until a clean edge is past the shear and the material is under the encoder.
- Press the CYCLE switch to reference the new coil.

Handling Material Flaws

With most roll formers and cut-to-length machines, material problems are common. The **MP300CL SERIES** controller has features that aid the operator when these flaws occur.

The best method of handling material flaws depends on when the flaws are detected and the duration of the flaw. If random small flaws occur, they are not likely to be detected until after the part has been cut by the controller. In this case, the only thing that the operator can do is make another part to replace it. This is easily done with the INCREASE QUANTITY function.

While viewing the Status Display, press SETUP until figure 4-9 appears, and then the number for INC QTY. This will cause the quantity “LEFT” on the Status Display to stay the same (not decrease) when the next part is made.

If a small flaw is detected before the shear, the operator may wish to crop the flaw out to minimize the amount of scrap material. On flying die machines, the CYCLE switch is active while the machine is running. The crop starts the production of the part over again and the operator can repeat this process until the good material occurs. In the case of feed-to-stop machines, the machine must be halted before the CYCLE switch is active. The operator would most likely jog the material forward until the flaw is past the shear and then press the CYCLE switch a second time.

There are times when material flaws can be extensive and last for a large portion of a coil. A user may find that this material is easier to handle if it is cut into short lengths rather than relying on the operator to crop repeatedly. There may also be secondary outlets for such material if they can be cut to standard lengths of perhaps 8, 10, and 12 feet. If this is the case, jobs for this purpose can be programmed at high job numbers (for example between 900 and 999 before hand), and the operator can switch production to these jobs when extensive flaws occur. After the flaw has been cleared, the operator can use the NEXT JOB function to resume normal production.

Chapter 5: In Case of a Problem

The **MP300CL SERIES** is a very reliable product, but things can go wrong.

The user can clear most problems, but AMS experts are always ready to help if needed.

We have many years of experience with all types of length controls and coil processing equipment. Our experience shows that problems are grouped into:

- **Machine problems** (most common)
- **Operator mistakes**
- **Incorrect Setup data**
- **Corrupted controller memory**
- **Cable damage**
- **Controller fault** (least common)

Troubleshooting is just a logical series of steps which leads to the likely cause of a problem. The only tools you need are an accurate scale or steel tape, and perhaps a multimeter.

This guide is a “self help guide” for the user to help troubleshoot the system. Follow these suggestions in the order listed.

Troubleshooting Guide

When did the Problem Start?

Did the machine work properly at one time? If not, have you done the **Calibration** procedure?

If the machine **did** work properly at one time, what has changed since then?

Did the problem start after routine maintenance? After electrical panel work? After a material change? After an operator change? Trace backwards in time to find out what's different.

Check the Machine

Check the **Encoder** to make sure it tracks the material perfectly.

The encoder **wheel** must be at right angles to the material. The wheel must rotate exactly parallel to the direction of material movement.

The wheel must be in firm contact with the material. **No slippage is allowed! But not so tight as to cause damage to the encoder or the material.**

Re-run the length **Calibration** procedure after any changes to the encoder mounting.

Check the encoder **cable** connections. They may have worked loose from material movement or vibration. Make sure there are no nicks or cuts in the cable.

Check the **shear** (or punch) press to make sure that it returns fully to its home position after each cycle. The press will make accurate cuts **only** if it starts from a known position for each cycle.

Re-run the length **Calibration** procedure after any changes to either press.

Visually check **other** parts of the machine for loose fasteners, excessive wear, proper lubrication, proper material feed, and roll former adjustment.

Re-run the length **Calibration** procedure after any changes to the machine.

Collect Data

Often the problem is that the machine is making out-of-tolerance parts. To deal with this type of problem, carefully measure the parts made and compare these numbers with those that were programmed. Also take note of the order in which the shear cut the parts.

Write down these measurements for possible later reference.

If length and punch placement seem to vary at random, check the encoder mounting very carefully. The encoder must move with the material, and cannot be allowed to slip. If dimensions are off in a consistent pattern, run the **Calibration** procedure.

Re-check Setups

Re-check Setup values with originally recorded values. When you installed the **MP300CL SERIES** controller, you should have recorded the Setup values on the form provided in the manual for your machine TYPE. Make sure that none of these values has changed.

Run the Calibration mode

When you do the Calibration, take great care to make accurate measurements. Be sure that you know how to reduce measuring error as much as possible with the scale or steel tape you use. A loose tip on your steel tape can add a large error into your measurements.

Use Built-in Diagnostic features

The **MP300CL SERIES** has a display mode. Press SETUP until the screen shown below appears.

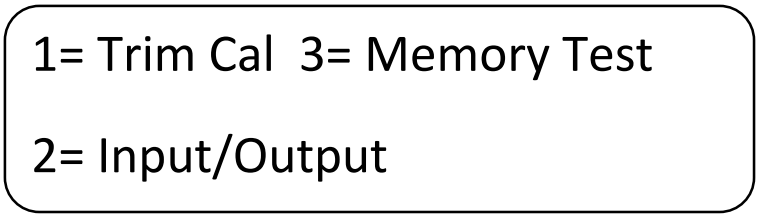

Figure 5-1. Trim Cal, Input Output, Memory Test Screen.

Press the number for Input/Output and the screen that is shown in figure 5-2 will appear.

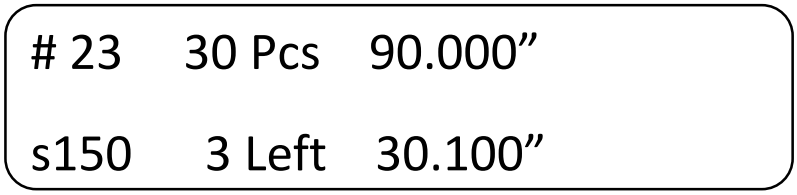

*Figure 5-2. **MP350CL** and **MP350PCL** Status Screen*

This screen will allow you to monitor the controller's inputs and outputs. Watch this display while the machine is running to check for motion, stopping, enable output, and press actuation points.

On the main Status display, you can watch line speed and distance past the shear. Compare what you see here to what should be happening as the machine runs.

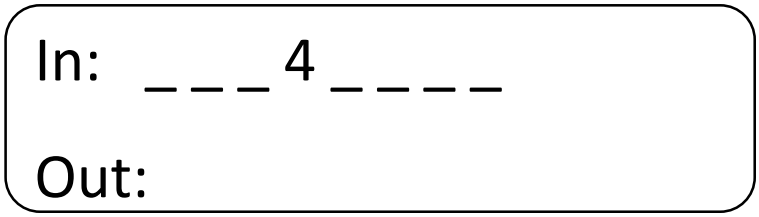

Figure 5-3. In / Out Screen.

Check incoming Power

Check incoming power for proper voltage. If you suspect fluctuations, watch the needle indication with an analog meter to see if they show up.

More advanced line monitors are available for stubborn cases that you can't see with ordinary meters. Use a recording line monitor to find problems that seldom show up. Your local power company may be able to help with this.

Cycle Power

Cycle power off and on. Try this if the controller "locks up" (won't respond to the keyboard). This may restore normal operation after an electrical surge. If not, clear the **MP300CL SERIES'** memory.

Clear Memory

Clearing memory will erase all Setup, Pattern, and Order information in the **MP300CL SERIES**' memory.

Do not clear the memory unless you have written down all Setup, Pattern, and Order information for re-entry, and you have tried everything else above.

You can clear all storage in the **MP300CL SERIES** (including Setup and Order data) by following this sequence:

(1) Make sure that the Security switch is unlocked;
(2) Turn off power to the controller;
(3) Wait five seconds;
(4) Press the '5' key while you
(5) Turn the controller's power back on;
(6) Hold down the '5' key for at least five seconds after you turn the power on.

Electrical Noise

The **MP300CL SERIES** should **not** lock up frequently. If it does, you should suspect that electrical noise is present.

Noise problems can be very hard to locate. The best way to avoid noise is by using good cable layout and wiring methods. Also, noise suppressor devices such as **varistors** are needed in some cases.

Refer to the AMS Application Note **"Noise Suppression Methods"** for details.

FAX Setup and Parts data to AMS

FAX Setup and Parts data to AMS with a full description of the problem. Unless you think your problem is very simple, you might as well FAX this information to us before you call. We'll probably ask you for it anyway.

Include the Model, Serial, and Software Version numbers.

Be sure to send a copy of the Setup Data Sheet, and all information about the problem. **FAX** us at **1-314-344-9996.** Don't forget to include your name and phone number so we can call you back.

Call AMS

If you can't fix the problem without our help, call AMS and speak with our experts. Call us toll-free at **1-800-334-5213**.

Have your **Model, Serial, and Software Version numbers** ready when you call.

Chapter 6: Hole Counter Option

Hole Counters may be added as an option to the **MP301CL** and **MP350CL** controllers. When this option is added, the controller will take on the new model numbers of **MP301HCL** and **MP350HCL**.

General Parameters

The controllers will have all the same general parameters as the ones without the Hole Counter option (as listed in Section 3, Machine Configuration). The following parameters will also be available to be programmed.

Mode

MODE describes whether the controller is using the Hole Counter option. Select COUNT HOLE to run the controller as a hole detector or select STANDARD for normal **MP300CL SERIES** operation. In the COUNT HOLE mode, the operator enters a number of holes instead of an actual part length. The **MP300CL SERIES with Hole Counter** detects holes in the material and activates the cutoff press when the programmed number of holes have been counted.

In the STANDARD mode, the controller uses a part length (inches or millimeters) to control the cutoff press. It is, however, still counting holes in the material and keeping track of where they are. If necessary, the operator can change from STANDARD mode to COUNT HOLE mode at any time when the line is halted without losing track of holes that have already been counted but not yet cut off.

Press any number key to toggle the display between STANDARD and COUNT HOLE. When the correct choice is visible, press ENT to record your selection.

Figure 6-1. Mode Parameter Screen

Shear-Detect

SHEAR-DETECT is the physical distance between the shear press and the hole detector. The detector should be located as close as possible to the shear press to achieve the best accuracy. Although the detector must be close to the shear press, the detector must be far enough away (typically 10" or more), to allow the controller time to see the hole and activate the shear press. Units for SHEAR-DETECT are in inches or millimeters. Key in the length and press ENT to record your selection.

Minimum Hole Spacing

Enter a value slightly smaller than the minimum distance between holes in the material. When the **MP300CL SERIES with Hole Counter** detects a hole in the run mode, the material must move the MINIMUM HOLE SPACING distance forward before another hole can be detected. This prevents the controller from accidentally reading the same hole twice on the leading and trailing edge. Units for MINIMUM HOLE SPACING are in inches or millimeters. Key in the length and press ENT to record your selection.

No-Hole Stop

This parameter defines the maximum length of material allowed to go beyond the shear press before enough holes are detected to make the current part. Operators may use this parameter to protect machinery in the case of a photo-detector failure. The **MP300CL SERIES with Hole Counter** will halt the line and display an error message if the “Length Past Shear” + “Shear To Detector Distance” is greater than “No-Hole Stop Distance”.

This function will be disabled if No-Hole Stop = 0 inches or if the operator chooses the standard operating mode. Key in the length in inches or millimeters and press ENT to confirm.

Programming

Standard Mode

Programming job data in the Standard mode of the **MP300CL SERIES with Hole Counter** is identical to programming an **MP300CL SERIES** controller. Refer to the Operating Procedures section of this manual (Section 4), for Standard Programming.

Count Hole Mode

Job

After pushing the PRG button, the first option will be flashing. If the controller is a multiple batch model (**MP350HCL**) the first option is programming the job number. Follow the procedure in the Operating Procedure section of this manual. If the controller is a single batch model (**MP301HCL**) the Job option will not be available.

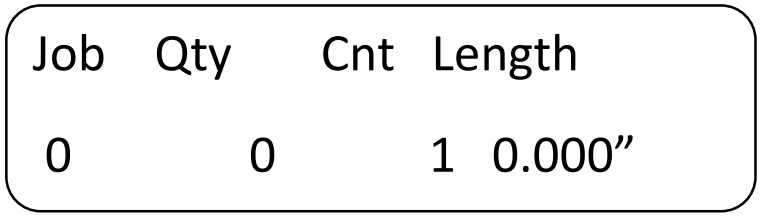

Figure 6-2. Count Hole Mode Programming Screen.

Quantity

To program in a job total, simply key in the desired quantity and press ENT to confirm the quantity. The quantity can be set from 1 to 9998 pieces. The quantity 9999 is treated as a special case by the **MP300CL SERIES**. When an order with a quantity of 9999 pieces is run, the quantity does not decrement when a piece is made. This is done for the convenience of users who produce parts until their storage bins are full and don't wish to count parts. The controller will continue to add the total number of pieces made along with the total footage used under the Footage screen in the Setup Menu.

Count

Key in the number of holes for each part and press ENT to confirm. The **MP300CL SERIES with Hole Counter** detects holes in the material and cycles the shear press when this number is reached. To cut on every hole detected, program a count of one. The maximum number of holes per part is 500.

Length

The next item to be programmed for a job is the Offset Length. Key in the number of inches, centimeters, or millimeters and press ENT to confirm. **THIS IS NOT THE OVERALL LENGTH OF THE PART**. The Offset Length is the distance from the leading edge of the last hole counted to the point where the shear occurs. See figure below.

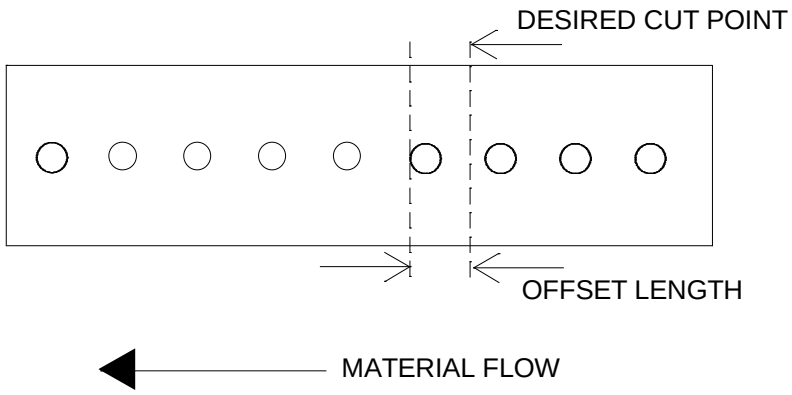

Figure 6-3. Offset Length

Exiting the Program Mode

The STAR (*) key is used to end the PROGRAM mode and revert back to the normal running display. It is also used to exit the SETUP mode.

Operation

The operation of the **MP300CL SERIES with Hole Counter** in the Standard mode is identical to the operation of the **MP300CL SERIES**. Refer to section 4 of this manual, Operating Procedures.

Status Display

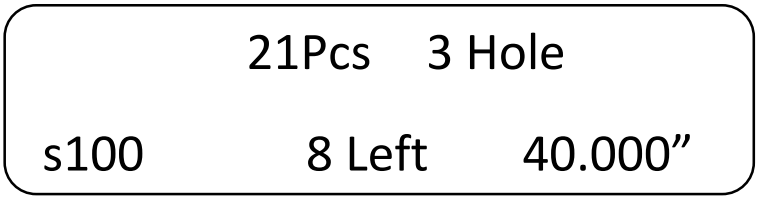

Figure 6-4. Status Display – Hole Count

A typical status display of the **MP300CL SERIES with Hole Counter** in the Count Hole mode is shown above. The top row shows the programmed quantity of the current order and the number of holes that have gone past the shear. The bottom row shows the machine speed, in feet per minute (or meters per minute), the quantity remaining, and the current length past the shear.

Note: Figure 6-4 is for the MP301HCL (a single batch unit), which means that there is no Job Number listed on the first line. Multiple batch units will include the Job Number on the Status Screen.

Running the Machine

After an order has been entered, the machine is placed in the RUN mode by either pressing the RUN switch on the front panel or closing the external RUN contact if the REMOTE RUN option is selected. The **MP300CL SERIES with Hole Counter** will begin counting holes and shearing parts to the programmed hole count. It will decrement the quantity remaining after each piece is cut and halt the line automatically when the quantity remaining reaches zero.

Note: The operator can not manually cycle the shear when the machine is running while the controller is in the “Count Hole Mode”.

Manual Shear

While the machine is halted, the operator may perform a standing crop cut by pressing the cycle push button on the controller's front panel. The die will move at the jog velocity until it finds the Die Retracted switch. After the Die Retracted switch is found, the die will move out to the last attainable hole and perform the cut at the currently programmed offset length. This hole must be out further than the MINIMUM DIE DISTANCE. If there are no holes in this range, the material will be cut at the MINIMUM DIE DISTANCE.

The operator must keep the cycle button closed until the shear has completed its cycle. If the cycle button is opened before the shear completes its cycle, there will be an error message that reads "Abort Shear Cycle", and the cut will not occur. This prevents the possibility of the operator's hands being under the press before the shear has completed its cycle.

Clear Holes

During jogging operations, the **MP300CL SERIES with Hole Counter** continues to count holes and records their positions in memory. If for any reason, the operator wishes to discard all of the hole locations which are currently in the controller's memory, he may do so by clearing the "Hole Queue." To clear the hole queue, the machine must be halted. Press the SETUP button twice so that the following screen appears:

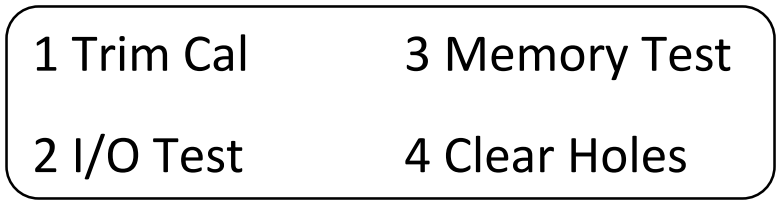

Figure 6-5. Trim Cal, I/O, Memory Test, Clear Holes Screen

Press the appropriate number to enter the Clear Holes mode. The controller message "Clear Hole Queue?" will appear with the option of selecting NO or YES. Press any number key to toggle through the choices and then press "ENT" to lock your selection into the controller.

Any holes which have been counted but not yet cut off, will be cleared from memory. After the **MP300CL SERIES with Hole Counter** is placed back into the

RUN mode, it will begin a new count of holes after the first hole passes the photo-detector.

Chapter 7: Setting the Customizing Switches

The **MP300CL SERIES** controller is a universal device capable of controlling several types of "cut-to-length" machines. In order to do this, some outputs and inputs have different functions depending upon the type of machine on which the controller was installed. Also, each type of machine has its own unique set of machine parameters that must be programmed. Parameters for one type of machine may have no meaning for a different machine. For example, a two speed "Flying Cutoff" machine needs a MINIMUM SLOW LENGTH when slowing down for a shear. This parameter would be useless on a "Feed-to-Stop" machine, and may confuse the operator.

In order to make the **MP300CL SERIES** controller applicable to many types of machines and still be easy to use, a set of customizing switches are included which define the type of machine being controlled. Once the machine type has been determined, the function of the outputs and inputs is fixed and the machine parameters are limited to only those required for that type of machine. Although adding a step to the first part of the installation, this approach simplifies the controller thereafter.

Before applying power to the controller, the customizing switches must be set. These switches can be found on the back of the controller. The switches are located near the center of the back panel. There are seven segments to the switch assembly numbered from 1 through 7 and are set to either the ON or OFF positions to match the requirements of the installation.

IMPORTANT SAFETY NOTICE: The motor should not be connected to anything while initial power up and dipswitch changes are taking place. Leaving the motor connected while doing so may cause severe damage to the machine and / or personal injury!

The chart that follows defines the purpose of each switch for every **MP300CL** model and a description of the switch settings follows the chart.

Note: After changing any switch setting all the setup parameters will be lost and have to be re-entered. Before changing any switch make sure you have the setup data recorded on the form provided in the back of this manual.

Model	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7
MP301CL	Machine Type	Machine Type	Run Mode	Encoder 1 Direction	Encoder 2 Direction	Analog Polarity	N/A OFF
MP301HCL	1 or 2 Speed	1 or 2 Speed	Run Mode	Encoder 1 Direction	Encoder 2 Direction	Analog Polarity	N/A OFF
MP350CL	Machine Type	Machine Type	Run Mode	Encoder 1 Direction	Encoder 2 Direction	Analog Polarity	Single Batch
MP350HCL	1 or 2 Speed	1 or 2 Speed	Run Mode	Encoder 1 Direction	Encoder 2 Direction	Analog Polarity	Single Batch
MP350PCL	Machine Type	Machine Type	Run Mode	Encoder 1 Direction	Encoder 2 Direction	Analog Polarity	Punch Disable

Table 7-1. Type Setting Switches Overview

Machine Type (Switches 1 and 2, MP301CL, MP350CL, and MP350PCL)

Switches 1 and 2 determine the basic type of machine that the **MP301CL, MP350CL,** or **MP350PCL** controllers are being installed on. These types of machines are as follows:

Switch 1	Switch 2	Machine Type
OFF	OFF	Feed-to-Stop, 1 Encoder
ON	OFF	Feed-to-Stop, 2 Encoders
OFF	ON	Die Accelerator, Single Speed
ON	ON	Die Accelerator, Two Speed

Feed-to-Stop

Machines with fixed dies must stop for each shearing operation. The operation of the **MP301CL**, **MP350CL,** or **MP350PCL** is considerably different for this type of machine as opposed to the flying die type. The major difference is that since the material does stop, the controller can check the position of the material against a programmed tolerance before activating the shear. If the machine is

out of tolerance, the operator can be warned. This ensures that no bad parts will be made. The **MP301HCL** and **MP350HCL** will not run in Feed-to-Stop mode.

Die Accelerator

Machines that do not stop the material for each shear are set to this type. The **MP350PCL** will not run in Die Accelerator mode.

Single or Dual Speed Closed Loop Die (Switches 1 and 2, MP301HCL and MP350HCL)

SW1	SW2	Speed
OFF	ON	Single Speed
ON	ON	Two Speed

Machines which shift into slow speed prior to the shear, require Switch 1 to be set to the ON position. Set Switch 1 to OFF for machines which operate at a single speed.

Run Mode (Switch 3, All Models)

OFF	Front Panel Run With Safety Interlock
ON	Remote Run

Control over how the **MP300CL SERIES** controller is placed in the RUN mode is determined by the state of Switch 3 of the customizing switch. In the LOCAL mode, the controller is placed in the RUN mode by pressing the RUN switch on the front panel of the controller. In the REMOTE mode, the controller is placed in the RUN mode when the REMOTE RUN input (#3) closes.

Local Mode (Switch 3 OFF)

With Switch 3 in the OFF position, the RUN switch on the front panel of the **MP300CL SERIES** controller is active and will initiate the automatic sequence, if a valid job has been programmed and the material past the shear is not longer than the next size to be cut. Input #3 is defined as the SAFETY INTERLOCK that should be connected to the Emergency Stop circuit of the machine. This input will not start the machine when it closes. It must be closed, however, prior to pressing the RUN switch or closed within one second after pressing the RUN switch. This allows time for a relay or a motor starter connected to the RUN output to energize and close input #3.

Remote Mode (Switch 3 ON)

With Switch 3 in the ON position, the RUN switch on the front panel of the **MP300CL SERIES** controller is inactive. The automatic sequence is initiated when the REMOTE RUN input (#3) closes and remains closed, conditional on a valid job number specified and the material past the shear not being greater than the specified part length. Opening input #3 or pressing the Halt button on the front of the controller will stop the machine.

Encoder 1 Direction (Switch 4, All Models)

Feed-to-Stop Machines

Switch 4 controls the counting direction of the motor encoder (resolver). Without enabling the drive, turn the feed rolls by hand in the direction they would turn if the material were moving forward. The displayed length past the shear should increase. If not, change the switch state, cycle power off and then on, and try again.

Flying Die Machines

Switch 4 controls the direction of the material encoder on die accelerator machines. Check for increasing counts when the material moves in the forward direction. If the counts are decreasing, change the switch state, cycle power off and then on, and try again.

Encoder 2 Direction (Switch 5, All Models)

Feed-to-Stop Machines

If a two-encoder system is used on a feed-to-stop machine, Switch 5 controls the counting direction of the material encoder. Check for increasing counts when the material moves in the forward direction. If the counts do not increase, change this switch state, cycle power off and then on, and try again.

Flying Die Machines

Switch 5 controls the counting direction of the die accelerator encoder or motor resolver. Without enabling the drive, move the die in the forward direction. The displayed length past the shear should decrease. If the length does not decrease, change the switch setting, cycle power off and then on, and try again.

Analog Voltage Polarity (Switch 6, All Models)

Switch 6 controls the polarity of the analog voltage output. Each servo drive is different and it is not possible to predict whether a positive or negative voltage is required to move the die in a forward direction. When an attempt is made to move the die, the die will either move in a controlled manner or it will move out of control at high speed into the limits. If the latter occurs, change the switch setting, cycle power off and then on, and try again.

Single Batch Operation (Switch 7, MP350CL Only)

OFF	Multiple Batch Mode
ON	Single Batch Mode

Placing Switch 7 in the ON position disables the multiple-batch capability of the **MP350CL**. Only one job at a time may now be programmed. This feature was added to simplify part programming for users who continuously make pieces at the same length and have no need to enter multiple jobs.

Punch Disable (Switch 7, MP350PCL Only)

OFF	Punch Disabled
ON	Punch Enabled

Switch 7 enables/disables the punch press outputs of the **MP350PCL** controller. Set Switch 7 to the ON position whenever an in-line punch press is to be used, feed to stop mode only. Set Switch 7 to the OFF position to disable all punch outputs and remove all references to punch press functions which may confuse the operator.

Chapter 8: Controller Model Types

There are many different types of controllers available from AMS Controls. The factors that will influence the model selected include whether the machine is a “Feed-To-Stop” line or “Flying Cut”, and if presses that perform punching are to be controlled.

Each individual controller will have its own unique set of parameters based upon the type machine used and the number of presses. Many parameters are common to all controllers, while some parameters are used under specific conditions, for example, the Hole Counter option may be added to the controllers.

The following section deals with each individual controller and will give a brief description of each of the closed loop controllers, the proper position for the configuration switches, a list of the inputs and outputs, and a list of the machine setup parameters for that model.

In the back of the manual there is a generic setup data sheet that includes all possible setup parameters. Please fill in the appropriate data for your individual controller on this sheet, as it will help the AMS Customer Service Department troubleshoot your machine in the event it is not performing at the required standards.

The numbers shown are the model numbers of the basic controller with and without the Hole Counter option. The letter H is used to re[resent the hole counter option. The letter R is used to represent the Rotary Shear option.

MP301CL = Has no options
MP301HCL = Has Hole Counting option
MP301CLR = Has Rotary Shear option
MP301HCLR = Has Rotary Shear with Hole Counting option MP350CL = Has no options
MP350HCL = Has Hole Counting option
MP350PCL = Has Punching option
MP350CLR = Has Rotary Shear option
MP350HCLR = Has Rotary Shear with Hole Counting option

MP301CL

General Description

The **MP301CL** is capable of controlling a single press (cutoff) and it will control machines with stationary or flying dies. The **MP301CL** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line. This controller is a single batch controller and as such, only one job may be entered at a time.

Switch Settings and I/O

SW1	**SW2**	
OFF	OFF	Feed-to-Stop, One Encoder
ON	OFF	Feed-to-Stop, Two Encoders
OFF	ON	Die Accelerator, Single Speed
ON	ON	Die Accelerator, Two Speed

SW3	OFF	Local Mode
	ON	Remote Mode

SW4	Sets the direction of Encoder 1 (Line Encoder on Die Accelerator) (Motor Encoder on Feed-to-Stop)
SW5	Sets the direction of Encoder 2 (Die Accelerator Encoder on Die Accelerator) (Line Encoder on Feed-to-Stop)
SW6	Sets the Analog output voltage polarity (+ or -)
SW7	Not Used, must be off

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear Down
5	Setup/Lockout	Drive Enable
6	Die Retract/Feed OK	Shear Up
7	Manual Shear	Batch Complete
8	E-Stop	Run

General Parameters

The following is a list of the machine setup parameters for the **MP301CL**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Refresh Done Job?**
- **Batching?**
- **Shear Dwell Dn**
- **Shear Dwell Up**
- **Shear Deadband**
- **Shear Kerf**
- **Shear Reaction**
- **Minimum Part**
- **Delay After Shear**
- **Line Movement**
- **Time Per Part**
- **Loop Gain**
- **Jog Select Mode**
- **Jog Velocity**
- **Max Velocity**
- **Min Velocity**
- **Acceleration**
- **Return Accel**
- **Min Slow Dist**
- **Min Die Dist**
- **Max Die Dist**

- **Advance After Cut**
- **Retract After Cut**
- **On Tol Error?**
- **Tolerance**
- **Offset Auto**
- **Off. Integral**
- **Lag Auto**
- **Lag Integral**
- **Derivative**
- **Job Comp. Time**
- **Line Resol.**
- **Motor Resol,**
- **Die Resol.**
- **Correction**
- **Filter Const.**
- **Units**

MP301HCL

General Description

The **MP301HCL** is capable of controlling a single press (cutoff) and it will control machines with flying dies using the Hole Detect option or in standard die accelerator mode using only the line encoder to determine when to cut. The **MP301HCL** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	**SW2**	
OFF	ON	Single Speed Line
ON	ON	Two Speed Line

SW3	OFF	Front Panel Run
	ON	Remote Run (Input 3)

SW4 Sets the direction of Encoder 1 (Line Encoder)

SW5 Sets the direction of Encoder 2 (Die Encoder)

SW6 Sets the Analog output voltage polarity (+ or -)

SW7 Not Used, must be off

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear Down
5	Setup/Lockout	Drive Enable
6	Die Retract	Shear Up
7	Hole Detector	Batch Complete
8	E-Stop	Run

General Parameters

The following is a list of the machine setup parameters for the **MP301HCL**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Refresh Done Job?**
- **Batching?**
- **Mode**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Shear Deadband**
- **Shear Kerf**
- **Shear Reaction**
- **Shear-Detect**
- **Min Hole Spacing**
- **No-Hole Stop**
- **Minimum Part**
- **Delay After Shear**
- **Line Movement**
- **Loop Gain**
- **Jog Select Mode**
- **Jog Velocity**
- **Max Velocity**
- **Min Velocity**
- **Acceleration**
- **Return Accel**
- **Min Slow Dist**
- **Min Die Dist**
- **Max Die Dist**
- **Advance After Cut**
- **On Tol Error?**
- **Tolerance**
- **Offset Auto**
- **Off. Integral**
- **Lag Auto**
- **Lag Integral**
- **Derivative**
- **Job Comp. Time**

- **Line Resol.**
- **Die Resol.**
- **Correction**
- **Filter Const.**
- **Units**

MP301CLR

General Description

The **MP301CLR** is capable of controlling a single press (Rotary Shear cutoff) non-stopping machine with stationary dies. The **MP301CLR** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1 Sets the direction of Encoder 2 (Line Encoder)

SW2 Sets the direction of Encoder 1 (Motor Encoder)

SW3 Sets the Analog output voltage polarity (+ or -)

SW4
OFF Front Panel Run
ON Remote Run (Input 4)

SW5

SW6

SW7

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	
3	Safety Interlock/Remote Run	Reverse
4	Manual Shear	
5	Setup/Lockout	Drive Enable
6	Home	
7		
8	E-Stop/Drive Ready	Run

General Parameters

The following is a list of the machine setup parameters for the **MP301CLR**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job?**
- **Batching?**
- **Minimum Part**
- **Line Movement**
- **Loop Gain**
- **Jog Select Mode**
- **Jog Velocity**
- **Tolerance**
- **Offset Auto**
- **Off. Integral**
- **Lag Auto**
- **Lag integral**
- **Derivative**
- **Job Comp. Time**
- **Line Resol.**
- **Circumference**
- **Rotary Count**
- **Rotary Start**
- **Rotary Stop**
- **Correction**
- **Filter Const.**
- **Units**

MP301HCLR

General Description

The **MP301HCLR** is capable of controlling a single press (Rotary Shear cutoff) on non-stopping machines with stationary dies using either the Hole Count Mode or the Standard Mode. The **MP301HCLR** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	Sets the direction of Encoder 2 (Line Encoder)
SW2	Sets the direction of Encoder 1 (Motor Encoder)
SW3	Sets the Analog output voltage polarity (+ or -)
SW4	**OFF** Front Panel Run **ON** Remote Run (Input 4)
SW5	
SW6	
SW7	

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	
3	Safety Interlock/Remote Run	Reverse
4	Manual Shear	
5	Setup/Lockout	Drive Enable
6	Home	
7	Hole Detect	
8	E-Stop/Drive Ready	Run

General Parameters

The following is a list of the machine setup parameters for the **MP301HCLR**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job?**
- **Batching?**
- **Hole Mode**
- **Shear - Detect**
- **Min Hole Space**
- **No Hole Stop**
- **Minimum Part**
- **Line Movement**
- **Loop Gain**
- **Jog Select Mode**
- **Jog Velocity**
- **Tolerance**
- **Offset Auto**
- **Off. Integral**
- **Lag Auto**
- **Lag Integral**
- **Derivative**
- **Job Comp. Time**
- **Line Resol.**
- **Circumference**
- **Rotary Count**

- **Rotary Start**
- **Rotary Stop**
- **Correction**
- **Filter Const.**
- **Units**

MP350CL

General Description

The **MP350CL** is capable of controlling a single press (cutoff) and it will control machines with stationary or flying dies. The **MP350CL** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	**SW2**	
OFF	OFF	Feed-to-Stop, One Encoder
ON	OFF	Feed-to-Stop, Two Encoders
OFF	ON	Die Accelerator, Single Speed
ON	ON	Die Accelerator, Two Speed

SW3	OFF	Local Mode
	ON	Remote Mode

SW4 Sets the direction of Encoder 1
(Line Encoder on Die Accelerator)
(Motor Encoder on Feed-to-Stop)

SW5 Sets the direction of Encoder 2
(Die Accelerator Encoder on Die Accelerator)
(Line Encoder on Feed-to-Stop)

SW6 Sets the Analog output voltage polarity (+ or -)

SW7	OFF	Multiple Batch Mode
	ON	Single Batch Mode

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear Down
5	Setup/Lockout	Drive Enable
6	Die Retract/Feed OK	Shear Up
7	Manual Shear	Batch Complete
8	E-Stop	Run

General Parameters

The following is a list of the machine setup parameters for the **MP350CL**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job?**
- **Batching?**
- **Shear Dwell Dn**
- **Shear Dwell Up**
- **Shear Deadband**
- **Shear Kerf**
- **Shear Reaction**
- **Minimum Part**
- **Delay After Shear**
- **Line Movement**
- **Time Per Part**
- **Loop Gain**
- **Jog Select Mode**
- **Jog Velocity**
- **Max Velocity**
- **Min Velocity**
- **Acceleration**
- **Return Accel**
- **Min Slow Dist**
- **Min Die Dist**
- **Max Die Dist**
- **Advance After Cut**

- **Retract After Cut**
- **On Tol Error?**
- **Tolerance**
- **Offset Auto**
- **Off. Integral**
- **Lag Auto**
- **Lag Integral**
- **Derivative**
- **Job Comp. Time**
- **Line Resol.**
- **Motor Resol.**
- **Die Resol.**
- **Correction**
- **Filter Const.**
- **Units**

MP350HCL

General Description

The **MP350HCL** is capable of controlling a single press (cutoff) and it will control machines with flying dies using the Hole Detect option or in standard die accelerator mode using only the line encoder to determine when to cut. The **MP350HCL** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	**SW2**	
OFF	ON	Single Speed Line
ON	ON	Two Speed Line

SW3	OFF	Front Panel Run
	ON	Remote Run (Input 3)

SW4 Sets the direction of Encoder 1 (Line Encoder)

SW5 Sets the direction of Encoder 2 (Die Encoder)

SW6 Sets the Analog output voltage polarity (+ or -)

SW7	OFF	Multiple Batch Mode
	ON	Single Batch Mode

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear Down
5	Setup/Lockout	Drive Enable
6	Die Retract	Shear Up
7	Hole Detector	Batch Complete
8	E-Stop	Run

General Parameters

The following is a list of the machine setup parameters for the **MP350HCL**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job?**
- **Batching?**
- **Mode**
- **Shear Dwell Dn**
- **Shear Dwell Up**
- **Shear Deadband**
- **Shear Kerf**
- **Shear Reaction**
- **Shear-Detect**
- **Min Hole Spacing**
- **No-Hole Stop**
- **Minimum Part**
- **Delay After Shear**
- **Line Movement**
- **Loop Gain**
- **Jog Select Mode**
- **Jog Velocity**
- **Max Velocity**
- **Min Velocity**
- **Acceleration**
- **Return Accel**
- **Min Slow Dist**
- **Min Die Dist**
- **Max Die Dist**
- **Advance After Cut**
- **On Tol Error?**
- **Tolerance**
- **Offset Auto**
- **Off. Integral**
- **Derivative**
- **Job Comp. Time**
- **Line Resol.**

- **Die Resol.**
- **Correction**
- **Filter Const.**
- **Units**

MP350PCL

General Description

The **MP350PCL** is capable of controlling a single press (cutoff) and a punch press on feed-to-stop machines with stationary dies. The **MP350PCL** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	**SW2**	
OFF	OFF	Feed-to-Stop, One Encoder
ON	OFF	Feed-to-Stop, Two Encoder
SW3	OFF	Front Panel Run
	ON	Remote Run (Input 3)
SW4		Sets the direction of Encoder 1 (Motor Encoder)
SW5		Sets the direction of Encoder 2 (Line Encoder)
SW6		Sets the Analog output voltage polarity (+ or -)
SW7	OFF	Punch Disabled
	ON	Punch Enabled

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Drive Enable
6	Die Retract/Feed OK	Punch
7	Manual Shear	Not Used
8	E-Stop	Run

General Parameters

The following is a list of the machine setup parameters for the **MP350PCL**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job?**
- **Halt No Parts to Run (With Punch Only)**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Shear Deadband**
- **Shear Kerf**
- **Minimum Part**
- **Delay After Shear**
- **Press Dwell**
- **Scrap Length**
- **Shear-Press**
- **Loop Gain**
- **Jog Velocity**
- **Max Velocity**
- **Acceleration**
- **Tolerance**
- **Offset Volts**
- **Line Resol.**
- **Motor Resol.**
- **Correction**
- **Filter Constant**
- **Units**

MP350CLR

General Description

The **MP350CLR** is capable of controlling a single press (Rotary Shear cutoff) non-stopping machine with stationary dies. The **MP350CLR** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1		Sets the direction of Encoder 2 (Line Encoder)
SW2		Sets the direction of Encoder 1 (Motor Encoder)
SW3		Sets the Analog output voltage polarity (+ or -)
SW4	OFF	Front Panel Run
	ON	Remote Run (Input 4)
SW5		
SW6		
SW7	OFF	Multi-Batch
	ON	Single Batch

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	
3	Safety Interlock/Remote Run	Reverse
4	Manual Shear	
5	Setup/Lockout	Drive Enable
6	Home	
7		
8	E-Stop/Drive Ready	Run

General Parameters

The following is a list of the machine setup parameters for the **MP350CLR**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job?**
- **Batching?**
- **Minimum Part**
- **Line Movement**
- **Loop Gain**
- **Jog Select Mode**
- **Jog Velocity**
- **Tolerance**
- **Offset Auto**
- **Offset Integral**
- **Lag Auto**
- **Lag integral**
- **Derivative**
- **Job Comp Time**
- **Line Resol.**
- **Circumference**
- **Rotary Count**
- **Rotary Start**
- **Rotary Stop**
- **Correction**
- **Filter Const.**
- **Units**

MP350HCLR

General Description

The **MP350HCLR** is capable of controlling a single press (Rotary Shear cutoff) on non-stopping machines with stationary dies using either the Hole Count Mode or the Standard Mode. The **MP350HCLR** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1		Sets the direction of Encoder 2 (Line Encoder)
SW2		Sets the direction of Encoder 1 (Motor Encoder)
SW3		Sets the Analog output voltage polarity (+ or -)
SW4	OFF	Front Panel Run
	ON	Remote Run (Input 4)
SW5		
SW6		
SW7	OFF	Multi-Batch
	ON	Single Batch

NO.	INPUTS	OUTPUT
1	Jog Forward	Forward
2	Jog Reverse	
3	Safety Interlock/Remote Run	Reverse
4	Manual Shear	Drive Enable
5	Setup/Lockout	
6	Home	
7	Hole Detect	
8	E-Stop/Drive Ready	Run

General Parameters

The following is a list of the machine setup parameters for the **MP350HCLR**. For detailed description of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job?**
- **Batching?**
- **Mode**
- **Shear - Detect**
- **Min Hole Space**
- **No Hole Stop**
- **Minimum Part**
- **Line Movement**
- **Loop Gain**
- **Jog Select Mode**
- **Jog Velocity**
- **Tolerance**
- **Offset Auto**
- **Off. Integral**
- **Lag Auto**
- **Lag integral**
- **Derivative**
- **Job Comp Time**
- **Line Resol.**
- **Circumference**
- **Rotary Count**
- **Rotary Start**
- **Rotary Stop**
- **Correction**
- **Filter Const.**
- **Units**

Chapter 9: Specifications

Mechanical

Size	8"X12.5"X2.25"
Weight	7lbs.

Electrical

Input Voltage	24VDC ±5%
Input Current	.5 Amp.

Output Characteristics

(Note: The following parameters apply equally to all versions.)

Std DC

Type	Open Collector JFET
Maximum Current	4 ADC
Maximum Applied Voltage	35 VDC

Analog

+ / - 10 Volt Differential

Solenoid Driver

Type	High Voltage Internal Driver
Minimum Load Resistance	12 Ohms
Maximum Voltage Generated	65 VDC
Minimum Actuation Time Between Cycles	0.25 Seconds

Encoder Input

Type	Bidirectional Incremental optical shaft encoder
Output Format	Complementary 2 channel quadrature
Voltage	5VDC
Maximum Encoder Load	200 milliamperes

Operation

Number of Batches	1 or 999, depending on model
Maximum Part Length	3500.000 inches 88,900 millimeters
Maximum Parts/Batch	9999
Units of Measurement	inches, millimeters, or centimeters
Footage Totalizers	3
Maximum Footage/Totalizer	1,000,000 feet 1,000,000 meters

Features

Display	48 characters in 2 rows
Keys	16
Controls	3 (CYCLE, RUN, HALT)

Chapter 10: Changes to the MP CL Software

The following is a list of the software changes and procedures that have been made to the AMS Controls MP Series Closed Loop controllers. This document will just be a list of the changes that have been made.

Software Changes For All MP300CL Series Controllers

An error was corrected on Die Accelerator controllers. A Task Error 0004 was generated if the die accelerated at a high rate at a very low velocity (SCN 388).

Occasionally during the controller's initial power up, the LCD would not initialize itself properly resulting in both lines of text being displayed on the top line of the LCD (SCN 427).

From a memory-cleared condition, the controller would fire the shear without a dwell time being entered; the shear would fire for an internally set default time of 10 seconds. The internal default was changed so the shear cannot be fired without a shear dwell time being entered (SCN 487).

Removed the setup parameter "Reference Mode {Standard / Die}". Increased the accuracy of the Hole Detect input (SCN 492).

Added new setup parameter, "Line Movement {FWD/FST / RUN}" (SCN 521).

Added new setup parameter, "Jog Select {Line / Die}".
Added new setup parameter, "Min Velocity".
Made changes to the Offset Volts and Lag Auto parameters. The controller will now "save" the previous values for Lag and Offset. If the values are grossly changed due to making a cut during an acceleration or deceleration of the material, or if an E-stop occurs while the die is moving, the Lag value will go back to the last "saved" number.
Added two new error messages, E-stop Max Lag – occurs if the Lag Auto parameter rises too high.

Min Die Distance – occurs when the die moves to make a cut and the Minimum Die Distance setup value entered is not large enough (SCN 522).

Added new setup parameter, “Shear Deadband”. (SCN 527)

Slow output in Die Test (SCN 534)
Coast to stop Timeout (SCN 535)
Critical Parameter Update (SCN 536)
Auto Ram Detect (SCN 537)
Die Test Changes (SCN 557)
Minimum Die Test (SCN 563)
Added Manual Shear Die Dist (SCN 564)
Encoder Not Referenced fix (SCN 575 & SCN 654)
No hole clear on power up (SCN 577)
Power off during die test (SCN 584)
Count holes after clear (SCN 611)
Advance after cut w/manual shear (SCN 613)
Increase queue (SCN 625)
Manual Shear bug fixed (SCN 656)
Clear hole queue (SCN 662)

	MP301CL	MP301HCL	MP350CL	MP350HCL	MP350PCL
SCN 388	Version 14.14	Version 14.05	Version 14.19	Version 14.01	Version 14.04
SCN 427	Version 14.14	Version 14.05	Version 14.20	Version 14.01	Version 14.04
SCN 487	Version 14.14	Version 14.06	Version 14.20	Version 14.02	Version 14.04
SCN 492	N / A	Version 14.06	N / A	Version 14.02	N / A
SCN 521	Version 14.14	Version 14.07	Version 14.20	Version 14.02	Version 14.04
SCN 522	Version 14.14	Version 14.07	Version 14.20	Version 14.02	Version 14.04
SCN 527	Version 14.14	Version 14.07	Version 14.20	Version 14.30	Version 14.04
SCN 534	Version 14.30	Version 14.30	Version 14.30	Version 14.30	N / A
SCN 535	Version 14.30	Version 14.30	Version 14.30	Version 14.30	N / A
SCN 536	Version 14.30	Version 14.30	Version 14.30	Version 14.30	Version 14.30
SCN 537	Version 14.30	Version 14.30	Version 14.30	Version 14.30	Version 14.30
SCN 557	Version 14.30	Version 14.30	Version 14.30	Version 14.30	Version 14.30
SCN 563	Version 14.31	Version 14.31	Version 14.31	Version 14.31	Version 14.31
SCN 564	Version 14.30	Version 14.31	Version 14.31	Version 14.31	Version 14.31
SCN 575	Version 14.30	Version 14.31	Version 14.31	Version 14.31	N / A
SCN 577	Version 14.30	Version 14.31	N / A	Version 14.31	N / A
SCN 584	Version 14.32	Version 14.32	Version 14.32	Version 14.32	N / A
SCN 611	N / A	Version 14.33	N / A	Version 14.33	N / A
SCN 613	Version 14.33	N / A	Version 14.33	N / A	N / A
SCN 625	N / A	Version 14.34	N / A	Version 14.34	N / A
SCN 656	N / A	Version 14.35	N / A	Version 14.35	N / A
SCN 662	N / A	Version 14.35	N / A	Version 14.35	N / A

The above chart shows which software versions the listed Software Change Notices take effect on.